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ABSTRACT

This document contains the papers on graduate and inservice teacher education from the SITE (Society for Information Technology & Teacher Education) 2001 conference. Topics covered include: media literacy across the curriculum; contextual learning about information technology (IT); IT in teacher education; reform in a graduate school technology program; the Brazilian national computer forum for education; integrating standards into educational technology masters programs; developing professional development schools; a teacher development model for scaffolding technology integration; teaching electronic information research skills to teachers; overcoming barriers to technology integration through mentoring; ensuring technology leaders; aligning graduate credit courses with standards; subject-specific technology integration training; teachers discovering and integrating technology; the South Central Regional Technology in Education Consortium; a partnership to enhance technology integration; ways to integrate technology into the classroom; information and communications technology (ICT) training for teachers; networked learning; whole theme learning in the Internet virtual community; constructing knowledge networks; models of professional IT development for practicing teachers; a framework for designing professional development courses in instructional technology for teachers; a professional development plan for integration technology; an inservice methodology course via the Internet; teacher reflections on learning new technology; the real practice of technology integration; the unique impact of Internet instruction on future teachers; an inservice teacher development for fostering problem-based integration of technology; multimedia in the classroom; reflections on the impact of ICTs; an instructional staff development project; the impact o change in attitudes on practice; comparing certificate and degree teacher education options; engaging learners with technology; multimodal distance learning; a course design overview of a World Wide Web-based program; revolution of the pedagogical use of ICT by influencing the whole school community; innovative program design and instructional methods for online teacher education; a graduate track in learning technologies; using the communities of practice strategy to enhance mentoring; teaching and learning in an online information technology environment; learning to learn in online courses; and teachers' inservice training needs. Most papers contain references. (MES)

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ED 457 828

GRADUATE & INSERVICE

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The appropriate integration of technology into today's learning environment remains a predominant area of importance within the areas of graduate and inservice. Research focused upon face-to-face, Internet-assisted and Internet-based learning environments has expanded imperative theoretical and application-based discussions. The appropriate and successful integration of technology within the learning environment is the focus of the outstanding articles within this section. The authors offer the latest research and theoretical issues through which the future of face-to-face and distributed learning environments will emerge. For ease of discernment, the following research paper summaries are presented in alphabetical order by the author's surname.

Arango-Montero, Asse, Aughey, Betancourt, Goller, Naranjo, Olmedo, Sanchez and Thirunarayanan examine the initial year of the Master of Science in Urban Education degree program with a specialization in Learning Technologies. A discussion surrounding an overview of the program and student comments is presented.

Braboy and Trivette offer a discussion of a project that aids educational endeavors related to analyzation techniques. This specific project focuses upon analyzing historical documents while focusing upon emotional and intellectual Socratic questioning methods.

Brownell and Brownell present the experiences and reflections associated with the design and development of a graduate-level course entitled EDTL 630 Media Literacy Across the Curriculum. Discussion surrounds the design and development of the scope and sequence for the course, equipment viability and availability and future development of the course.

Burnett, Bonnici, Dresang and Thomas provide information concerning the Web-based opportunities for contextual learning. Their efforts are focused upon school library media specialists.

Cakula focuses upon the Latvian need for inservice professional development opportunities for educators. An examination of the design, development and implementation of an interactive course with Swedish and Latvian educators is presented.

Cheeks presented a summary of program evaluation research surrounding a graduate School Library Media Program. Radical changes in school library media services necessitated the evaluation, which focused upon the elimination of the disparity between job competencies required by the specialists and job competencies within the School Library Media Program.

Civiletti and da Silva analyzed data pertaining to a social-international and constructivist emphasis within the attitudes and pedagogic practices of educators. The Brazilian "Computer Course Applied to Education" was the focus of the study.

Coombs examines the International Society for Technology in Education (ISTE) five-step curriculum standards outline that is focused upon all advanced programs in educational computing and technology. A discussion of each of the five steps suggested by ISTE includes a suggestion for future graduate-level course interpretation.

Cooper and Hirtle call for a reprieve from the disparities between the learning and the technology integration in the K-12 environments. A focus upon the curricular scope and sequence, as well as the course instructional design, is emphasized.

Dailey, McNelis, Struck and Wall address the shortage of secondary special education professional development schools (PDSs) within the professional education of teacher candidates and inservice teachers. A case study of Townson University is presented.

Engel and Sparrow focus upon the online Educational Technology Master's degree program at Florida Gulf Coast University. Further, rationales for decisions made within the program structure, students and program evaluation techniques are discussed.

Ertmer, Johnson and Lane reflect upon a teacher development tool that is designed for scaffolding technology integration within a learning environment. The engagement of educators as well as the inclusive reflective

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activities facilitates the expansion of the teacher's ability to integrate technology within a learning environment.

Figarella presents a case study of technology integration within elementary-level learning environments. The initial semester of the case study is the focus of the paper.

Fourie explores the world of distance education as it relates to the education of graduate-level teachers who are focused upon electronic information research skills. The author notes that considerable success was achieved for all students, even those who dismissively labeled themselves as "computer illiterate".

Franklin, Duran and Kariuki examine the collaborative use of graduate Instructional Technology students as mentors for inservice elementary educators. A discussion surrounding just-in-time (JIT) learning, professional development opportunities and possible alternative assessment methods are discussed.

Gibson presents a discussion surrounding the impact and results associated with the integration of the ISTE foundation standards within the teacher candidate education program at Wichita State University. An examination of the resulting benefits to the involved entities is also presented.

Goss, Kinslow and Welsh describe the development of a graduate-level teacher certification program for "Teaching and Learning with Technology". The program matrix with NETS-T performance indicators is clearly articulated.

Grandy, Strickland, Sammons and Strickland focuses this study upon the planning, administration and follow-up of a junior high Earth Science Program that focused upon the appropriate and successful integration of technology. Findings from attitude surveys are included.

Gunter presents a study that focused upon the integration of technology within specific classroom curriculum while taking an online graduate-level educational technology course that was focused upon K-12 educators. Quantitative as well as qualitative data were obtained and presented.

Heath, Dimock and Burniske reflect upon a program that provides focused professional development opportunities and information services to teachers and administrators. The focus is to support and focus upon learner success.

Hornung and Bronack describe a partnership that focuses upon the appropriate and successful integration of technology within learning environments for preservice and inservice educators. A discussion surrounding the successful scope, sequence and scheduling of professional development opportunities is emphasized.

How explores innovative aspects associated with the integration of technology into a classroom-based learning environment. The paper revolves around the specific Web site developed by How.

Hughes and Walker discuss a United Kingdom-based professional development scheme that attempts a university response to K-12 educators' needs. The integration of technology as educational aids within the online environment is discussed.

Hung, So and Pow offer an exploration of a project-based approach towards the development of a learner's conceptual framework through a multimedia teaching resource bank. The rationale, concept, description of the four stages of development, outcomes and limitations are presented.

Iran-Nejad, Xu and Venugopalan present a study concerning wholetheme learning through an Internet-based community. The results of the initial aspects of the study are positive and encouraging.

Irvine, Larkin-Hein and Prejean focus upon middle school science classrooms and the learner's construction of knowledge networks. The integration of technology, curricular developments and questionnaire results are shared.

Jenson, Lewis and Smith offer innovative models of professional development opportunities for inservice educators, focused specifically upon instructional technology. The authors move beyond the workshop environment to examine an often-overlooked implementation strategy.

Kennedy presents a framework through which to design professional development course opportunities within the specialization area of Instructional Technology. The focus is on meeting the needs of individual educators.

Kibben, McDonald, Tangney and Holmes explore the first-year teacher candidate's attitudes concerning the role of technology within a classroom environment. Two graduate-level students were focused upon as the case study reviewed the attitudinal shifts over their initial year.

Kitchenham outlines a professional development model concerning the implementation and integration of technology within an educational environment. The preliminary results of an analysis are presented.

Klein-Wohl describes the design of an Internet-based methodology course for inservice educators. The perspective of the paper is from the designer's point of view and includes discussions surrounding the learning potential of the instructional model within the distributed learning environment.

Kortecamp examines qualitative data concerning teacher's perceptions of himself or herself as they proceeded to learn new technologies for implementation within the classroom environment. The emergence of common themes is fully discussed.

Kylama and Silander emphasize the pedagogical revolution that is afoot. The emphasis upon shifting pedagogical practices must begin with the whole school community.

Lambert provides a report of a pilot study findings related to the understanding, conceptual understanding and integration of technology into a teacher's classroom environment. Several strategies that may support the teacher's learning curve are discussed.

Lare offers a qualitative study on the impact of Internet-based learning environments on teacher candidates. The interesting results obtained from the study are discussed.

Lee and Lo present the findings of a study focused upon the integration of instructional technology within a Taiwan Junior High School's English classroom environment. Three major findings are presented.

Lehman, Ertmer, Keck and Steele report on the professional development opportunities focused upon inservice educators. The subject matter of the professional development opportunities is the support towards the problem-based integration of technology within a classroom environment.

McCauley, Porter, Tuinmann and Donkers describe a technology-focused online professional development opportunity program for teachers. This program meets international standards and focuses its efforts on addressing key aspects in ITC training.

Marcovitz describes a pilot project's results concerning teachers who were enrolled in the Multimedia Design in the Classroom course at Loyola College in Maryland. The use of multimedia software applications and Visual Basic for Applications (VBA) were emphasized.

Mullick and Sarner document a two-year period surrounding technology-integrative professional development opportunities. The results indicated that one-year and two-year longitudinal results were positive.

Norton and Farrell reflect upon the question of attitude and classroom practice shifts surrounding the integration of technology within a learning environment. A summary of data is examined from the 1999-2000 time period.

Norton and Schell offer an introspective question associated with many facets of the educational process and then offer results from a research study comparing teacher certification and graduate degree options for teacher educators. Questions surrounding what is the impact of technology, and how many classes must a teacher candidate or inservice teacher encounter to impact the appropriate and successful integration of technology into the classroom environment, are explored.

Papdopoulos, Karamanis, Ioannou and Houssou document the Hellenic Pedagogical Institute's implementation of a teacher-focused professional development opportunity project. The design principles and implementation processes of the project are described.

Reynolds and Morgan explore the inservice teacher's attitudes towards professional development opportunity. Numerous positive and opportunities for further delineation of professional development opportunities are offered.

Sammons reflects upon online asynchronous experiences, as associated with personal cooperative videos. A multimodal distance learning experience is documented.

Shih and McLaughlin present the curricular scope and sequence of the Web-based Masters of Science in Agronomy program at Iowa State University. A discussion of formative evaluations and a summative evaluation of the course content is also presented.

Tamashiro, Reitinger and Lewis provide a discussion surrounding the innovative aspects associated with online teacher education. Program design and instructional methods implemented within the online environment are examined.

Tu and McIsaac offer an innovative analysis of strategies associated with communities of practice that are focused upon the enhancement of mentoring situations. Mentoring models associated with doctoral students are discussed, as well as the Communities of Practice (CoP) model is presented.

Whipp and Schweizer explore strategies that students implement and foster to succeed within an online educational environment. The metacognitive, motivational and social strategies that the students implement towards a successful online course experience are examined.

Williams, Burns and Oostenink describe initiatives surrounding professional development opportunities in which teachers, curriculum specialists and administrators focus upon aspects of an engaging learning environment. Further, the impact of technology is discussed.

Yildirim, Kocak and Kirazci document a Turkish study that focuses upon the teachers' competency associated with technological aspects of the learning environment. Further, recommendations towards successful and effective technology-related professional development opportunities are offered.

Graduate and inservice theoretical discussions and research that impact the learning environment are imperative to the ever-expanding conceptual framework. Pertinent theoretical issues surrounding graduate level and inservice teacher professional development must be carefully considered and are imperative as technologies become more available within learning environments. The authors within this section have presented rigorous research, contemplative theoretical discussions and thoughtful reflections that exemplify the cutting edge of the world of instructional technology.

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Democracy in America: Rural America Takes an Adventure Through the American Mind

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Abstract: The use of electronic primary sources provides authentic pieces of the past for students and teachers alike, but these primary sources pose a new challenge for teachers. Teachers need to be trained in techniques for analyzing historical documents and strategies for raising the intellectual and emotional questions that will draw the students' interest. Misuse of electronic primary sources can create a greater distance between students and learning if the teacher is not prepared in both technology, primary source evaluation, and their integration into the curriculum. The "An Adventure of the American Mind" project is the first to meet this challenge head on.

Introduction: In Experience and Education (1938), Dewey defined education as the process of continuous reconstruction of experience with the purpose of widening and deepening its social content while helping the individual to gain control of the methods involved. Dewey used terms like democracy, interest, and growth without giving them precise meanings. Former North Carolina governor, James Hunt, reflected his opinion of education by arguing that the real function of schooling is to make technologically literate citizens. While many philosophies of education disagree with Hunt, the current demand for technology literacy in the classroom requires teachers to teach beyond the basic skills. Teachers and students must master the three C's: communication, collaboration, and creative problem solving. Education's challenge is to transform all formal institutions of learning, from pre-K through college, to insure that we are preparing students for their future not our past.

(Photo taken from ***American Memory*** ***http://www.loc.gov***)

The Project Initiative: A major USA initiative in our field, "An Adventure of the American Mind" continues in rural western North Carolina. In October 1999, the project began recruitment of local area in-service teachers to participate in a graduate-level course in Spring 2000. Collaborating with Mars Hill and Brevard College, Montreat recruited 48 teachers to be the pilot group for the program. The graduate course began in January 2000 with 28 teachers traveling to Montreat College and 20 traveling to Mars Hill College. Laptops were given to each teacher to provide them with the basic technology resources they would need. The teachers were introduced to the Library of Congress' website American Memory, which contains over three million digitized items from the Library's collection, and built interactive lessons using these primary sources and Microsoft PowerPoint and FrontPage.

After completing the course in May, 20 teachers applied for and attended an intensive four-day summer institute at the Library of Congress in June. They were given tours of the rare books, maps, and photograph collection areas, and the archivist met with the teachers and explained the collecting and digitizing process. Those teachers who were unable to attend the institute in Washington, D.C. attended a three-day summer institute at Montreat, Mars Hill, or

Brevard College. The local institute also was made available to teachers not participating in the program and the response was incredible. Sixty-four in-service teachers attended.

The laptops have proven to be a beneficial asset to the project. Most schools in rural western North Carolina are without funding for technology; in some cases, the laptop is the only computer in the school. The graduate course provides the time teachers need to search for online materials and build lessons integrating the highly demanded technology. The project provides technical and curriculum support up to one year for the teachers participating in the project.

Findings: Issues did arise in the first year of the project. Some of the schools had limited Internet access and some had none. To combat this issue, the teachers were introduced to Juno, a free email and Internet access provider, and shown how to use a phone jack to dial in. Another issue was Internet filters. Some schools could not access American Memory due to some of the primary source materials contain politically incorrect terms. This proved to be the most difficult issue to resolve due to this being out of the scope of the project. The project could only suggest to the schools' network administrators that the American Memory site be allowed through or a different filter be used. Most schools were able to gain access to American Memory.

Conclusions: In its second year, the project will be reaching over 300 in-service teachers in 15 counties covering the western part of the state. The pilot group of 48 teachers is in phase two of their participation and are mentoring other teachers from their schools, which is doubling the number of teachers being trained. Two universities, Western Carolina and Furman, have been added to the project; thus, the area being reached has been enlarged to include western South Carolina.

The initiative has brought much excitement to students as the teachers involved have "brought to life" historical, primary resource documents and photos. Teachers and students of all ages have found working with and manipulating these primary resource documents a valuable, authentic learning tool. Through the integration of the laptop with the primary resources, students are making personal connections with their own learning.

References:

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After the Pilots: Media Literacy Across the Curriculum

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Abstract: This paper traces experiences in the development of EDTL 630 Media Literacy Across the Curriculum through three pilot offerings. The course is now a part of an M.Ed. in Classroom Technology program and an elective in an M.Ed. in Teaching and Learning program. Differences in the two target populations are identified and discussed. A detailed schedule/activity-set for the course is presented. Equipment availability issues, course coverage, the importance of course topics, and further development, are also covered.

Introduction

Media literacy is well established as a curriculum component in every major English-speaking country in the world, except for the United States. Fortunately, in the last several years, that has begun to change in the U.S. (Tyner, 1998; McBrien, 1999). Media Literacy, defined as the ability to access, analyze, evaluate and produce communication in a variety of forms (Aufderheide & Firestone, 1993) has begun to be addressed in state standards, the KÐ12 classroom, and teacher education. (Kubey and Baker, 1999; Hobbs, 1998).

In an earlier paper (Brownell & Brownell, 2000) we discussed the development of a masterÕs level graduate course, ÒMedia Literacy Across the Curriculum.Ó This paper reports on experiences in teaching three pilot offerings of the course to two different populations.

Two pilot offerings were taught to students enrolled in a MasterÕs of Education in Classroom Technology program. This program, which follows national guidelines developed by the International Society for Technology in Education and adopted by the National Council for Accreditation of Teacher Education, offers teachers the opportunity to gain in-depth knowledge and experience with technology as applied to K-12 education. It also prepares graduates to serve as technology integration specialists in their building or district.

One pilot offering was taught to students in a MasterÕs of Education program in Teaching and Learning. This program is designed to offer teachers an opportunity to gain in-depth understanding of the teaching and learning process, including relevant aspects of modern curriculum studies as well as aspects of various instructional techniques. Students apply this understanding, on a practical basis, to their professional experience in their chosen area of education.

Basic Principles

There are several basic principles and ideas that form the basis for this course. First, regarding media messages, key concepts of media literacy have been identified as follows: 1) All messages are constructions; 2) Messages are representations of social reality; 3) Individuals negotiate meaning by interacting with messages; 4) Messages have economic, political, social and aesthetic purposes; and, 5) Each form of communication has unique characteristics (Hobbs, 1997). Second, the course is taught using the acquisition model of media literacy, wherein media are viewed as opportunities to explore and gain skills to process such constructions in a mindful way, rather than as products that manipulate individuals and groups (Desmond, 1997). Third, a hands-on component to the course is essential so that media literacy concepts can be better understood. By producing media, we can gain a better understanding of the sea of media in which we swim daily. Additionally, producing media is beneficial in that it is a powerful, empowering experience. Fourth, media literacy is viewed as a set of concepts and techniques that are integrated into the existing curriculum - media literacy is not taught as a separate subject. Fifth, such a course offers an important opportunity to view technology beyond just the computer - for example, still cameras, camcorders, stand-alone DVD players, audio recording devices in various formats, etc. Sixth, media literacy allows people to begin to understand the many literacies we actually need to develop to fully function in modern society (Tyner, 1998; Considine and Haley, 1999). Such literacies include alphabetic literacy, visual literacy, technological literacy, and so on. These literacies do not exist, or function, in isolation. Multiliteracies are prevalent and powerful in our society and attention needs to be paid toward developing all aspects of the various literacies needed to function in our society. Seventh, and most important, media literacy offers a new way to see the world. Media, especially in our society, are everywhere, to the point of being such a part of our lives that we rarely notice them, let alone break them apart and analyze them as constructions. This is important also because as increasingly powerful technologies such as the web and digital, interactive TV become more widespread, they need to be understood as the powerful constructions they are. This is essential if they, and other media, are to be useful and used by society, rather than allowing such media to be used for the manipulation of individuals and groups. As participants start to see media as constructions they gain a new view of their daily experiences. This can be a truly amazing, transformative experience.

Since the principles and concepts above include some production experience, the practical issue of equipment must be addressed. Ideally, each participant will have his or her own set of equipment including, but not limited to, a computer and appropriate desktop video software, a digital camcorder with an assortment of associated external microphones, necessary blank media, an instant, film-processing still-camera, and a minidisc or cassette portable recorder. In our case, we were able to obtain five sets of equipment which we use in-class and which are signed out to self-selected groups of students to use outside of class. Fortunately, the learning curve for the iMovie software is not steep and students can readily learn the skills needed with the software in order to apply the concepts covered in class. In the future we intend to both increase the number of sets of equipment available to students for check-out as well as upgrade the computer labs and camcorders, etc., available on-campus.

Experiences: M.Ed. in Classroom Technology Groups

Experiences in the pilot courses offered to students in the M.Ed. in Classroom Technology program have been insightful. Comments such as the following are common from participants: "I now see the news and TV in a new way and see why my students need this content and these skills," and, "I never considered the amount of media I'm exposed to everyday and that they are constructions that can have a wide variety of purposes."

It is obvious to us that participants see the need for the course and for media literacy across the K-12 curriculum. Participants have said, "This is exactly what this program needed!" In one of the two pilots cited here, and in another currently being taught, a number of students who completed the M.Ed. program and graduated, have returned to take this course immediately after graduation. It is also obvious that, especially because of participants' interest and background in technology, the technical skills required are easily learned with little direct instruction in-class. Once the background technical skills and relevant concepts are operative, a process of production, group analysis, and more practice takes the students a long way into successful work with video as stand-alone movies on tape, via the web, and as clips within presentation software. Further, this production aspect complements the other content in the course and opens ever increasing doors to integrating media literacy into the curriculum.

Experiences: M.Ed. in the Teaching and Learning Group

The M.Ed. in Teaching and Learning group provided insights for which we were not prepared. First, albeit they were a self-selected group, their ability and previous experience with technology was at a much higher level than expected. This made the hands-on portion of the course flow effortlessly. They were fluent with technology and applied that fluency to those aspects of the course. Second, their understanding of the scholarship and intellectual underpinnings for media literacy was exemplary, as was their facility (and excitement) in finding ways to integrate media literacy into the curriculum. Upon reflection, given the focus of their M.Ed. in Teaching and Learning program this should have been expected. (Their program is designed to offer an opportunity to gain inÐdepth understanding of the teaching and learning process, including relevant aspects of modern curriculum studies and various instructional techniques.) In any event, it helped to make the course a success for all concerned. The course is now regularly offered as an elective for the M.Ed. in Teaching and Learning program.

Sample Tasks

The following are tasks that are part of the course. Each is briefly annotated to give a sense of the activity. Obviously, students receive written and verbal instruction and clarification for each task prior to commencing work on the given activity. Also, activities are sequenced to occur after relevant content has been covered in the course and all tasks are approached from a media literacy perspective.

Discussion Sheet I & Discussion Sheet II - Each student, per specified criteria, prepares one discussion sheet for each of two chapters in the main text used in the class (currently, Tyner (1998), and then leads (along with a partner if so assigned) a discussion on the content in that chapter. A variation of this activity is sometimes used to conduct the discussion via the group's listserv as either a structured or an unstructured discussion.

TV ad assignment - Each student tapes and presents a current TV ad which is analyzed by the group.

TV analysis assignment - Each student, per specified criteria, analyzes and presents that analysis of a TV show of any type (sitcom, drama, talk show, news, documentary, etc.)

In-camera edited Video/Curriculum Creation - After learning and practicing in-camera editing techniques, participants design an assignment integrated into some area of their current curriculum that incorporates the camcorder and in-camera edited techniques.

iMovie creation #1 and iMovie creation #2 - After a tutorial on iMovie, for #1 students create a movie on a topic of their choice that is shared with and analyzed by the group. For #2, students create an ad using iMovie that is shared with and analyzed by the group.

Web-site analysis - Participants 1) identify and provide an annotated list of web resources on media literacy; and, 2) choose either a self-promotion site, an advocacy site or a city site and analyze the site per media literacy concepts.

Major Project - Students choose an area of the curriculum and devise ways to integrate media literacy concepts and techniques into that area of the curriculum and either: 1) present a product demonstrating such potential integration in the future, with an explanation regarding media literacy concepts; or, 2) present material as in number one, plus present student products from implementation of the integration of media literacy into the existing curriculum.

Sample Schedule

Two of the three pilots have been taught using an alternate week format. In this format, students meet in the evening for five hours once every two weeks throughout the semester (including a brief dinner break). The following detailed schedule is offered to give a feeling for the flow of the course. (Time for each activity is approximate.) It is offered with the usual qualifications: 1) the course is always changing (materials, currency of topics; etc., 2) "flexible purposing," is readily employed, i.e., if something of great educational benefit develops during a session, it is explored and exploited. For example, during the 2000 presidential election, unforeseen but beneficial experiences regarding media literacy were readily followed as they appropriately arose. Also, note that each section had the video equipment available for one-half of the course. Since the course is designed to be approximately 30% hands-on, this presented no problem.

Meeting #1

I. Course Introduction -

Syllabus and Introduce Discussion Sheets/Sign-up for two chapters (30 minutes)
Intro to Media Literacy (70 minutes) - Brief Slide Show plus Renee Hobbs tape
II. In Camera Editing
Terminology/Concepts - slide show (30 minutes)
In-Camera Editing Activity (60 min. - planning/shooting)
In-Camera Editing Activity - Share/discuss/analyze and Equipment Check-out (80 minutes)
Assignment for next class in two weeks - Read Chapters 1 & 2 of Tyner. Locate a place in the curriculum to integrate an in-camera edited assignment - write-up a 1 - 1.5 page description/debriefing questions, shoot the video as if you were the student. Submit in VHS format!

Meeting #2

I. Discussion of Tyner Chapter 1 (30 min.) and Tyner Chapter 2 (30 min.)
II. Submit in-camera edited video assignment/share/analyze/discuss (60 min.)
III. Video Editing on the Computer and Equipment Check-out (2.5 hours)
Assignment for next class in two weeks - Read Chapters 3 & 4 of Tyner. Play with the digital camcorder and the iMovie software and prepare a brief product (your choice) and a 1 - 2 paragraph description of your product. (May be done in pairs and/or one triplet.) Bring your product for the next meeting, on VHS tape!

Meeting #3

I. Discussion of Tyner Chapter 3 (30 min.) Tyner Chapter 4 (30 min.)
II. Share/analyze/discuss iMovie product (60 minutes).
III. Photography -
Still Images - Concepts for Analysis (10 minutes)
Tell a story in images (Use Polaroids) (50 minutes)
Share photographic story/Photography in the Classroom Ideas and Resources (Brainstorm) (30 minutes)
Photography in America - Depth and Perspective (1 hour video)
Assignment - Read Chapters 5 & 6 of Tyner. Create a video ad using iMovie. Generate a shot list, shoot and edit the video. Bring your product for next meeting, on VHS tape!

Meeting #4

I. Discussion of Tyner Chapter 5 (30 min.) Tyner Chapter 6 (30 min.)
II. Share/analyze/discuss iMovie ad creation (45 minutes)
III. Equipment Check-in! (15 min.)
IV. TV in the culture and the classroom
TV viewing survey (30 min.)
TV as Curriculum (Video, handouts and discussion/ resources/activities re/ TV in the classroom - 90 minutes)
Introduce final project assignment (30 minutes)
Assignment for next class in two weeks - Read Chapters 7 & 8 of Tyner. Watch one TV show of one of the following types - sitcom, drama, talk show, news, documentary, or other of your choice, and answer the relevant (supplied) media literacy questions (and others you may generate) and devise one strategy for integrating the show you watched into the curriculum. (Note: Center for Media Literacy, and medial listserv.)

Meeting #5

I. Discussion of Tyner Chapter 7 (30 min.) Tyner Chapter 8 (30 min.)
II. Share TV show assignment (60 min.)
III. Ads and advertising
"The Ad and the Ego" video/discussion (90 min.)
"Production Notes"/discuss OR Analyze current ads activity (60 minutes)

Assignment for next class in two weeks - Read Chapters 9 & 10 of Tyner. Tape one TV ad you either love or hate. Bring the tape (VHS format) to class next week and be prepared to discuss: 1) why you love/hate the ad, and, 2) how you might integrate it into the curriculum. (You may want to look at the "AdCritic" web site or a similar resource for background.)

Meeting #6

I. Discussion of Tyner Chapter 9 (30 min.) Tyner Chapter 10 (30 min.)
II. Share/analyze TV ads (45 minutes)
III. Introduce web site analysis assignment (15 minutes)
IV. "Reading the Movies" Concepts/Activity (150 minutes)
Assignment for next class in two weeks - Complete the web site analysis (from a media literacy perspective) assignment.

Meeting #7

I. Share and discuss the web site analysis (from a media literacy perspective) assignment. (60 minutes)
II. "Reading" the News activity (30 min.)
III. "Reading" the News - video, discussion (90 minutes)
IV. Music Videos and Messages (90 minutes)

Meeting #8

Final Project Presentations/Closure

Conclusion

In consulting with a national figure in media literacy during course development, we were warned that very quickly we would see the need for additional courses in this area. That has been our experience, exactly. In this one particular offering there is always a feeling that more time is needed. (Not uncommon for any instructor in any course!) However, given the positive student response across both programs, the wide range of media literacy topics, the many appropriate opportunities to integrate media literacy into the K-12 curriculum, and the exciting possibilities with digital camcorders, especially when paired with desktop video, we are now investigating the development of a second course in this area. In the current course, with a mix of 70% concepts and 30% hands-on experiences, students gain a firm grasp of the scholarly issues and research supporting media literacy, solid technical skills, and awareness of various opportunities for the practical application of media literacy in the curriculum. One possibility we are considering is flipping course content in a second course to yield a mix of 70% hands-on experiences (developing increased, inDdepth facility with desktop video) and a 30% concepts portion developing an increased understanding of issues, research, scholarship, and applications in the curriculum. Whatever happens next, we are off to a good start and look forward to more positive experiences with future participants in the existing course.

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Contextual Learning:
Learning About Information Technology through Information Technology

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Abstract: The purpose of this institutional session is to acquaint the audience with the opportunities for contextual learning through web-based instruction for school library media specialists by the Florida State University School of Information Studies. It includes a justification of need and an overview of the certificate and degree programs that meet these needs. The web-based interface and tools employed are demonstrated and their pedagogical framework is discussed. Finally, specific examples of the ways that contextual learning principles are incorporated into a sampling of four of the courses included in the program is provided.

Introduction

Contextual learning through web-based instruction for school library media specialists has been a goal of the Florida State University School of Information studies for four years. In this paper, we provide a justification of the need for such an approach, and an overview of the certificate and degree programs that meet this need. The web-based interface and tools used by the School to deliver all of its degree programs are introduced and the pedagogical framework is discussed. Finally, specific examples of the ways that contextual learning principles are incorporated into a sampling of four of the courses included in the program is provided. These courses include the Instructional Role of the Information Specialist, Information Needs of Young Adults, School Media Collection Development and Management, and Design and Production of Network Multimedia. Each course demonstrates a unique approach to incorporating context into pedagogy and learning.

Justification of Need & Overview of Certificates and Degrees

In many areas in the state of Florida, as well as in other parts of the United States, there has been a critical shortage of school media specialists for a number of years. In addition, school media specialists who have been successfully working for years find themselves faced with new opportunities and responsibilities related to the rapidly changing information landscape of the past decade. One solution to meeting the needs of both these groups is to provide learning in context. Recent developments in web-based Internet technology make it possible to support learning about information technology and its use through information technology.

Preparation of the school library media specialist is normally accomplished through the completion of the forty-two hour master's degree in library and information studies. Students may opt for a certificate that requires just thirty credit hours, but do not receive the monetary rewards that many districts provide for those who complete graduate degrees. For those students who currently hold a master's degree in another area, the post-master's specialist in education degree, also thirty credit hours, is an option for preparation that often brings with it the monetary rewards that accompany the completion of an advanced graduate degree.

The Florida State University School of Information Studies has developed web-based distributed learning degree programs to serve certificate, master's and specialist students regardless of their physical location.

The delivery interface has been custom designed and the support tools carefully selected to support contextual learning principles. Students learn about information technology both formally in the two production courses required by the state, and informally through using the technology to support their own learning.

Interface and Support Tools

The interface used to deliver all courses was developed in-house and has been widely recognized both nationally and internationally. The development of the interface included a conscious application of contextual learning principles. At each stage of development, focus group interviews and usability testing were conducted. Informal feedback, in the form of unsolicited email messages, "Tell the Dean" sessions and exit interviews, was also collected. There have been four major revision cycles that have occurred based on the analysis of the formal and informal data.

The current version of the course website makes use of a database backend and ColdFusion technology to power its operations. The interface incorporates HTML frames to create a consistent "window frame" through which students view the course. This window frame includes a set of navigational buttons that enable the student to move easily through the different elements of the course, including the calendar, syllabus, resources, discussions, assignments, announcements, communication, help and home. When the student first logs on to the website, and until s/he acknowledges that the syllabus has been read, the syllabus appears in the main window. Once this acknowledgement has been recorded, the student's primary view of the course is through the course calendar.

Custom-designed support tools support both the students' learning and the faculty's teaching needs. Tools to support two formats of communication—synchronous and asynchronous—are included in the course websites. Synchronous communication is handled through the incorporation of a commercial product known as *ichat,* while asynchronous communication is handled through a home-grown threaded discussion tool originally written in PERL. Discussion boards are organized into three major functional groupings: The Faculty Office, The Technical Discussion Area, General Discussion Area, and Special or Small Group Discussion Areas.

Also integrated into the course websites are tools to support learning assessment. These include the capability to compose, deliver, provide feedback, and automatically grade multiple-choice and true/false tests; track attendance and participation in the synchronous communication sessions; deliver, submit, and grade assignments online; as well as an electronic gradebook that may be maintained throughout the course and enables the student and the instructor to receive both interim and final grade reports. The assessment tools are fully customizable to suit pedagogical styles and objectives.

The most recent developments in the interface relate to support for research. The interface was modified to conduct a delphi study on leadership characteristics in the library and information studies field in 2000. Logging of interaction files, including synchronous and asynchronous communication, has provided the basis for a pilot study on interaction in distance learning that was conducted in 2000. A coding scheme for analyzing the content of these interactions was developed during the pilot and will be incorporated into the website in 2001.

Integration of Contextual Learning in Four Selected Courses

Teaching Information Literacy by Becoming Information Literate: The Instructional Role Context of the Information Specialist

Paul Zurkowski, the president of the Information Industry Association, first used the term "information lliteracy" in 1974 (in Loertscher and Woolls, 1999, p. 1). He described information literates as 'people trained in the application of information resources to their work…They have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information-solutions to their problems." (Zurkowski, 1974, p. 6).

The American Association of School Librarians, in *Information Power: Building Partnerships for Learning* (AASL, 1998) identifies four roles for the school library media information professional: teacher; instructional partner; information specialist; and program specialist. In addition, the organization promotes nine information literacy standards for student learning, with attendant indicators for each standard. By incorporating the use of computer, telecommunication, and graphic technology along with standards for information literacy into each assignment, students learn contextually or by application.

The Instructional Role of the Information Specialist is a course designed to promote the use of a process approach to teaching and learning. The course website directs student attention immediately to the textual course introduction, as well as the Asynchronous Activity Real Audio/Power Point presentation. Using *Information Power* as a course text, and information literacy standards as a theoretical basis for teaching and learning, students are guided through the completion of seven assignments that reflect information literacy standards. All assignments may be submitted electronically directly to the course website, depending upon the presentation format selected by the student as being appropriate to the individual assignment.

In the first assignment, for instance, students are required to complete a survey form in which they provide information relating to previous, current, and hoped for career employment and interest areas. This brief assignment is designed to assist in meeting the instructor's need for information – i.e., the various levels of experience, background, and career direction of class members, in order that course work and assignments can be individualized to the greatest extent possible. Two other assignments direct students to locate, examine and analyze information from a variety of sources and in a variety of formats as a prelude to assignments that follow. Students are directed to web locations, electronic databases, and print resources at which teaching models, instructional models and lesson plans can be found. Students select eight plans or models that are pertinent to their area of interest, and document their selection by means of an annotated bibliography or webography, which is submitted electronically to the course website.

After defining the need for information, determining possible sources for that information, locating and evaluating the information, students then begin to use the information they have located by designing their own teaching unit or instructional model, incorporating information literacy skills into that unit. The completed unit is submitted electronically to the course website. After the unit is evaluated and approved by the instructor, the student then proceeds to deliver or present the teaching unit or model, documenting the delivery either by video taping the presentation and mailing the video tape to the instructor (students are permitted to "send" the video tape via the course website if they have the appropriate technology available) or by creating a Real Audio/Power Point presentation, submitted electronically via the course website. Two additional assignments require that students prepare and present a lecture/demonstration of an electronic database, computer program or other instructional technology, and a lecture/demonstration or written material promoting or publicizing an event or service offered by their institution or organization, using appropriate technology to deliver their presentation to the instructor. Students generally prefer either video tape or Real Audio/Power Point as delivery mechanisms.

By integrating information literacy and technological literacy skills into each assignment, students become adept at locating, preparing and organizing information from a variety of sources for presentation to others. They are encouraged to work collaboratively with subject area specialists (classroom teachers) in the preparation and delivery of the teaching unit or lesson. While assignments are designed for individual student completion, class discussion, or IChats, are frequently organized in small group format to enable students to more easily synthesize, analyze and assess or evaluate the discussion topics (information)

Understanding the Information Needs of Students: The Young Adult Context

Information Needs of Young Adults is a course required for all school media candidates, but the course enrollment includes a variety of others students, including those intending to become library administrators or public library children's specialists. A few students enroll out of personal interest. The course is an overview of the characteristics and the information needs of young adults and the resources and strategies that may assist adults and youth in meeting these needs. Five developmental stages of young adults are taken into consideration in understanding their information needs: intimacy, intellect, independence, identity, and integrity. The course starts with a historical overview of resources, after which four weeks are spent identifying the information needs of young adults ages 12 – 18. The remainder of the course explores resources categorized by both genre and developmental stage to meet the identified needs. Numerous strategies and employed in the course to assist the students to advance their skill in employing technology in the context of learning. Assignments and discussions capitalize on web resources.

Students are asked to read articles about the information needs and resources for young adults. A number of these students are available through a virtual library – consisting of either article for which permission has been sought and granted or links to articles from the reading list that appear in various places on the web. The advantage of reading the articles on the web is that links to other related articles are embedded. The content of the article is greatly enriched because of other sites. For example, a web-based article on graphic novels for teens might link to other bibliographies, conventions, essays, news groups, and reviews; to information on legal issues in graphics publishing; or to critical information on both the art and the business of comics publishing for more than 20 years, all within easy reach of the reader.

Numerous young adult novels and non-fiction books are assigned for reading during the semester. Students submit a read and react on a web-based form that is available for other students to read. Links to these reactions are posted in the windows in the synchronous discussions "rooms," and serve as the basis for group analysis of the readings. Each week there are both small group and large group discussions of the week's readings in chat rooms. To supplement this photos of young adults and interviews with them are posted on the web site, and teens are invited to participate in at least one online session with class members. Interviews by experts in the field of young adult resources are interviewed and visit live chats also. These exercises emphasize using the web as a communication tool.

The mid-term consists of a booktalk by students. Two methods are given for submitting the audio portion of the booktalk. Students may record it on an audiotape and mail it to me or they can send it as an audiofile. Other students are required either to read a written form of the book talk submitted via the web (required of all regardless of the audio format) or to listen to the audio file if it is posted on the web. They meet in groups to discuss and critique the booktalks submitted by others in their group and in the class as a whole. Once again the submissions are posted in the ichat windows (and in the assignment index) for others to read. The web technology allows students to easily see what their classmates have done without endless (and really impossible) paper duplication. The web technology extends the efforts of each class member and makes the teaching of critical evaluation skills easier and more authentic.

The final assignment is to read five books written a winner of the Margaret A. Edwards Award for Young Adult Literature given annually by the Young Adult Library Services Association of the American Library Association and to read literary critiques of their works and to relate biographical information about the authors to their writings. This leads the students into research using the web, as they turn first to web resources for the listing of the award winners and their books, for the availability of the books in online catalogs to which they have access, for the critical reviews of their books, and for biographical information on their authors. In the course of doing the assignment they hone their searching techniques and their evaluation of resources on the web. Each student writes a summary of his or her paper that is posted for other students to read and discuss during the last night of class. Students are allowed to request electronic copies of their classmates' papers.

School Media Collections in the Information Age: The Collection Development and Management Context

School Collection Development and Management is required for all students seeking school media certification. Many of the class are working either as classroom teachers are in school media centers with out-of-field certification. Occasional other students, particularly those who will work with youth in public libraries or those focusing on collection development and management take the course. The course is an introduction to the principles, policies and applications of collaborative school media management, including the national, state, community and school contexts that affect a media specialist's selection, evaluation, acquisition, access to, and maintenance of resources in a school media program. The assignments in this course are particularly conducive to contextual learning.

The students are asked to sign up for three electronic discussion and news groups during the first month of the course, to monitor them, participate in them only if they have professional questions or items to add (not as a student assignment), and then to prepare an analysis of their experience, including the usefulness to a practicing school media specialists. The first of the three groups is *AASLNews*. This is a read only and only moderately active news sources that comes from the American Association of School Librarians. It is particularly useful for information regarding legislation, grants, conferences, and publications relating to school media center resources. The second is *LM_Net*, a listserv that has more than 12,000 participants involved in school media work. It is available in digest form which I advise the students to use because of the overwhelming nature of the information, much of which relates to collection development and management issues. This is the electronic resource that the students find most useful because of the vast array of professional knowledge on virtually any related topic that is available to them. Most say they plan to continue their subscription. The last source is *Education Week* which using push technology sends a summary of the week's news in education to those who sign up with links to the full text publication and articles of interest. This provides context for the students as they student the many issues affecting collection development in media centers. I also ask the students to explore the AASL site as it has links to curriculum connections and numerous other types of resources.

The other two major assignments relate to the collection development and management policy of the Bellingham Washington Public Schools, an exemplary but not perfect district policy in a state that also offers important guidelines. In one of the assignments, the students focus in on the Instructional Materials Selection Policy of Bellingham and compare it to the American Library Association guidelines, also online at the ALA site, critiquing its inclusion and omission, based on what they have learned in class and from their textbooks, readings, and lectures. The second assignment asks them to look at the extensive collection management document (more than sixty pages if printed) and to analyze it from a number of different angles. Between the time I taught this course in the summer 2000 and in the fall 2000, the Bellingham Public Schools had updated their document, so it is a "living resource" that again brings authentic learning through the web to the students and alerts them to the vast resources available.

Because many students in this class are already somewhat knowledgeable in their topics and many have school experience, asynchronous discussions using a web board feature on the class site allows in depth sharing of professional knowledge. One such assignment asks the students to discuss experiences with or questions about censorship. Part of the discussion has them analyze two of six censorship cases studies in an interactive mode. The second asynchronous assignment asks them to read one research article from *School Library Media Research*, an online research journal, and from *Knowledge Quest* or *School Library Journal* (more practitioner oriented journals) and to discuss them on the web board. There are specific guidelines for the expected form and amount of participation and both discussions last a week and require a culminating "what I learned" statement from the students. Students identify this as one of the most valuable activities of the course. It allows them to capitalize upon the expertise within the class with guidance from what they have learned through the course work. This emphasizes the web as both a source of information and an extraordinary medium for communication. Synchronous discussions are held also.

Mirror to Glass: Reflections the Web as an Information Context

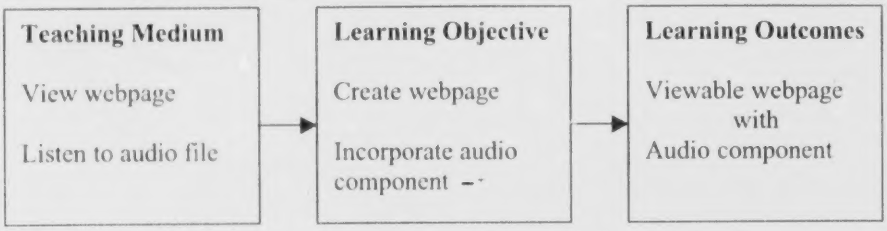
Logging into the Design and Production of Network Multimedia course website, Florida State University, School of Information Studies students are automatically directed to the course calendar. New to the world of designing and developing products for the Web, the students' conceptual understanding is limited to what they see within a web-page document. Thus, their understanding of a web-based multimedia document is surface-level. Unfamiliar with the intricacies of technology such as HTML, Metadata, CGI, graphic and audio files, the webpage at the students' current level of understanding is like a mirror reflecting back an image of the information presented.

Using the web as a teaching medium, enhanced with synchronous and asynchronous communication formats, the students and instructor work in a collaborative fashion to learn web-based multimedia technologies. Two assignments are submitted with students working individually to produce a product. Simultaneous to the learning of the specific technologies presented in the course, students are introduced to the methods of group work processes. Assigned to groups, students work in collaborative teams to design and develop a prototype product for a specific client.

The course commences with HTML as the primary topic. Using visual presentation format such as PowerPoint slides in conjunction with the National Center for Supercomputing Application's Beginner's Guide to HTML website, students embark on an adventure in learning to create web-based documents. Using the hand-tagging method, by the end of the third class session each student has created a simple yet complete webpage. The product is a resume contributing to the development of their professional portfolio.

Building on the foundation of knowledge in HTML, students continue learning technologies that enhance the basic website. Students are introduced to Unix, metadata, CGI, graphics and audio allowing for the incorporation of interactive components that enhance the transfer of information via a web-based document. Particularly interesting is that the teaching of these technologies utilizes the media as a tool of instruction. For example, the audio portion is taught by presenting a webpage produced by the instructor. Students are directed to this website from the Ichat room. Once at the site the students will find a brief textual introduction followed by a button labeled "sound byte." Students proceed to listen to a brief audio lecture of the instructor explaining how to incorporate a sound file into a web document. At the end of the sound byte students are directed to view the code for the webpage and note the HTML code used to present the sound file. Essentially, the instructor is using network multimedia as a vehicle of instruction and as a teaching tool to demonstrate to students how to create network multimedia products.

Figure 1: Utilizing the Media as an Instructional Tool



As a result of the instructional process outlined above, the students' understanding of the technologies used to present information on the web is raised to a level where they know how a webpage is produced. Thus, students move from viewing a webpage as a reflection of content to seeing through the page to the intricacies of multimedia used to present information. In a sense, the webpage becomes transparent allowing for a better understanding of the best methods to use in the provision of information via the Internet.

Conclusions

Each of the four courses examined in this paper: *Instructional Role of the Information Specialist, Information Needs of Young Adults, School Media Collection Development & Management*, and *Design & Production of Network Multimedia*, provides an important role in the successful web-based delivery of contextual learning to school media library specialists. Through participation in this program, potential school media library specialists learn to teach information literacy while becoming information literate themselves; expand their understanding of the information needs of different populations while learning about the information needs of young adults; learn the principles of collection development and management in the dynamic and sometimes volatile context of the World Wide Web; and are empowered to see through the mirrors of information contexts through participating in the process of designing and building information contexts themselves. School media library specialists are empowered to lead their schools into the 21st century through contextual learning on the World Wide Web.

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Information Technologies in Teacher Education

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Abstract: Despite of immense and positive changes in schools in Latvia over the past years, the school situation is still characterized by various difficulties. There is clearly a need for in-service training in a modern, non-soviet and democratic way for teachers in the region. Our idea is making an interactive course including combination of Computer Science Didactics, attitudes – Values and Teaching methods. We have international group of Swedish and Latvian teachers who finished first part of this course.

Introduction

European scientists as one of the general targets in higher education for 21st century set that education should be more elastic to divide resources and reshuffle potential accordingly requisition which related with enlarge area of using new technologies (Teichler, 1996). Social function of education is to organize all-rounded personality development with recent knowledge in determined profession. At that moment exist some objective contradictions:

1) between individual intellectual and physical potential from one side and limited time and economical facilities from other side,
2) between tendency to independence in selection of knowledge and existing professional forms and methods of processing new specialists now,
3) between quantum of information and superficial knowledge from one side and quality of practical acquirement in teacher profession from other side.

Perpetual problem of existing teaching system in former soviet countries is expeditious and factual moral aging of acquired knowledge apropos of dynamic technological and organizational process oriented to west countries. In process of acquiring education go awry combination of values and norms with knowledge, skills and mind development in whole which could ensure harmonic and humane development of personality. The dominant of education content is far from function unity (Karpova, 1994*)*. Many psychologists and educationalists have a view that the information technologies (IT) is the beginning of radical upturn in the education. There is a way for free education and we need to talk about social dimension in learning process using IT.

An information system of Latvian education is currently being implemented in Latvia which will be a substantial input in the improvement of the technical facilities of the school, and training the teachers to work with the new information technologies (IT). As the majority of the presently working teachers have never worked with the computers and on the Internet before, this will be a crucial turning point in the development of education in Latvia. However, short courses for teachers are not effective to implement IT into practice, neither will they help to solve many other problems arising in the schools in connection with IT.

Pedagogical practice constitutes a complex web of relationships between teachers and pupils and the social contexts that they represent. It is through the pedagogical action of teachers and pupils that knowledge development in a wider sense - the development of knowledge, attitudes and values - can come about in these social contexts. Today, there is general agreement in pedagogical research that pedagogical action essentially consists of communication. While many appreciate pedagogical action as an influential process centered on individual knowledge development directed towards a defined goal, others see pedagogical action as communicative. To take a double societal perspective as a starting point means that pedagogical practice can be understood in both perspectives.

The study.

Before starting teacher international in-service course we research the situation in Latvia and Sweden and select general aspects and necessities for both countries. The present situation can be characterized in the following way:

- shortage of teachers in certain subjects;
- incompetence of teachers in using IT;
- lack of new practical teaching methods;
- unequal professional level of teachers in social sciences;
- shortage of teachers with professional pedagogical education.

What knowledge would be most necessary for teachers?

- Psychology (contact, empathy, self-evaluation) because there is a big routine in every day school life.
- Sociology, how society developments are interlinked for evaluating school programs.
- Pedagogics and didactics for teachers with special subject education.
- Teaching methods using new informatic technologies.
- Integrated teaching subjects and selection of useful material which supplement several subjects.
- Interactive teaching, group work and project as a method.
- Analytical and reseach skills, foreign languages (especially English), computer Science basic skills and work with the Internet, use of special computer programs in certain subjects, awareness and use of possibilities.
- Distance education, life long learning through IT, skills and knowledge to non-stop improve one's life quality (physical, mental, moral, material).
- Value orientation (I – the environment – the world), health education (dependence from various drugs, violence, rest).

A teacher in-service course had been developed. Main theories connecting with this course are democratic principles of education (Dewey 1994), philosophical action theory (Kagan 1974, Kvetnoj 1974, Leontjev 1977) and learning theory as a cognitive approach which connected to meaning and content significance of the information, logical arrangement of learning materials – construction theory (Bruner 1961,1990, Piaget 1964, 1976).

Many changing proceses are going in our society and in the result the goal of education becomes not to get a large base of knowledge but more important how to get knowledge. It changes learning process from illustrative and demonstrative (give knowledge in complete form) to problem oriented process (to get knowledge in incomplete form). When knowledge is incomplete, experimentation takes place to discover new knowledge about a particular domain. It means to develop research method in studying process. Research method contains identification of the problem, imagine the solution, realizing the research, evaluating the result and modification it in praxis (McNiff, 1993). This is the purposing process and studying at all is purpose oriented action (Eric de Corte, 1996).

Knowledge become more deeper and developing of skills more larger as a result of group work because students take part in studying process more dynamic. "Collaborative learning makes public our own learning, learning of others and learning of the group" (Manjanovic, 1999, p.130). It is also social and democratic process. Popular is face-to-face group work but it has some failings. Students who want to dominate enchain others to their ideas. International groups better exchange with ideas but they have more problems with language. It is possible to involve students in learning process more productively using the new information technologies and problem solving. The course is focused to using information technologies and problem solving in teacher in-service education.

It is famous to use the computer in learning process as a tool. One of most effective tasks in learning process are research task. It could be used in individual work searching for information, making papers, using practice programs to developing special knowledge and skills. Recent interest to learning suggests the possibility of integrating sociological and psychological approaches around a notion of learning as activity

(Lave and Wenger, 1991). IT here could be not only as information source but also to make interactive collaboration computer – student or student – computer – student (Light, Light, 1999). When students solve a problem together in pairs or small groups they think more effectively than when they work alone (Kruger, 1993). In group work in place to write an essays computer could be use as a tool for produce multi – media presentations involving graphics, sound and text, for produce a resource (as example data file) to be used by other students or for produce a learning pack for their peers. These new goals are too great for any one student to meet, but cooperative work is essential if we are to take opportunities on offer with classroom computers (Underwood, 1999).

Sometimes IT is seen as threatening to cut learning off from the interpersonal context which give it meaning and utility. A counter-argument that might be offered is that the community practices of student life are actually more threatened from other directions. Some of more interesting applications of information technology in education are those involving computer – mediated communication. This technology affords a possible means of providing for interaction between tutors and students and between students themselves (Light, 1999). The term 'co–operative learning' refers to learning environments in which small groups of students work together to achieve a common goal. It can be differ in two ways. The members of the group may choose to take responsibility for sub-tasks and work co-operatively or they may collaborate by working together on all parts of the problem. If the learners collaborate and share in the decision–making process the level of social interaction is necessarily high but it is not so necessary for co-operative workers. There are some positive effects in group work can be that learning under positive contact conditions can facilitate interpersonal relationships which may in turn have positive effects: on student motivation, self–esteem, academic learning. Some collaborative groups may be efficient because of conflict based mechanisms as Piagetian model (Piaget, 1985) and others due to co–constructive processes (Vygotsky, 1978). Howe develops Piagetian model, that when pairs of students differ not only in their predictions about problem outcomes but also in their underlying conceptual understanding then collaboration facilitates learning. O'Malley (O'Malley 1992) has shown that when a computer program makes different predictions then the human learner is more likely to show evidence of conceptual change than they do when that program either makes similar predictions or show similar conceptions. Learning in groups and with peers may be a more effective way of achieving some educational goals that individualize instruction especially in work with computers but here the important role play discussion. There are some researches which explore whether individual learning is facilitated in computer environments by interaction between students whose conceptions differ and whether the benefits are directly attributable to interaction. (Howe et al.,1992, Howe et al., 1995). There are also some concepts that the computer may facilitate productive interaction in a way that other media cannot, by dint of its capacity to maintain a clear task structure and to provide feedback. However, the studies also showed that in some contexts interaction may be of marginal significance, with shared action being crucial instead. It would appear that such context may be defined by a variety of factors, not all of which are readily controllable. It is though that the computer may still have a central role to play. Main factors which determine productivity of learning process are individual differences (gender, ability, thinking and practice skills, needs) and differ of the environment (group size, kind of task and organization, working room and environment, direction of study). Unified model of productive group work might need to establish how to promote shared action in more positive fashion and how to integrate it with interaction. It need to take both social or contextual factors and individual processes of cognition. Social exchange and joint action are crucial to group performance and individual learning, but at the same time individual perceptions, reflections and knowledge are key determinants of how interaction proceeded and what results it has.

In Latvia we have some problems in pedagogical work. Many teachers don't have an updated pedagogical education. There are many teachers that are incompetent in using IT. In some schools there is a negative atmosphere and attitudes between teachers and pupils are not very sound. Several schools have shortage of teachers in certain subjects. There is a lack of new and practically oriented teaching methods. The professional level of schools and teachers is very uneven, especially when it comes to social sciences. Vidzeme University College in serving as the main institution of higher education in the region of Vidzeme in close cooperation with Växjö University (Sweden) and Educator Training Support Center at the Ministry of Education and Science of the Republic of Latvia have decided to build up teacher education at Vidzeme University College. The emphasis is put on in-service training. The best solution for our courses we find the problem-based learning using IT.

Outcomes.

The main target group of students are teachers in primary and secondary schools in the region of Vidzeme and Vaxjo that have a need for updating their skills and knowledge. Each school makes a team of 4 teachers who works together on one problem. In first turn there are 8 Latvian and 5 Sweden schools with their small teams. The teaching staff will be made up of teachers already employed at Vidzeme University College and Växjö University. The first course started in November, 1999. The courses offered at Vidzeme University College was in the initial phase be taught jointly by Latvian and Swedish teachers. That is; during each class there are 1-2 Latvian teacher(s) from each part (values – attitudes, teaching methods, computer didactics) and 1 Swedish teacher in the classroom assisting each other. Such an approach secure an open dialog giving the teachers a very practically oriented way of learning from each other as well as comment on each other's performance following the lectures. The Latvian and Swedish teachers do not teach only groups in Latvia. They do jointly teach groups of Swedish students (teachers wanting to upgrade their skills and knowledge) in the same subjects as taught in Latvia. That is; 1 Swedish teacher and 1 – 2 Latvian teacher(s) assists each other in teaching in classrooms at Växjö University. Such an approach opens up new and more practically oriented ways of educational cooperation based on comparative thinking.

The selection of study programs have been based on several factors:

- written recommendations made by teachers and school directors from schools in all parts of the region of Vidzeme;
- conversations between representatives of Vidzeme University College and Växjö University on the one hand and teachers and school directors at schools in Vidzeme on the other hand made during visits to schools in Vidzemes augstskola;
- observations made by representatives from Vidzeme University College and Växjö University;
- questionnaire conducted among teachers at schools in Vidzeme by teachers at Vidzeme University College.

The language of teaching during the courses in Latvia will be Latvian and English. The language of teaching during the courses in Sweden will be Swedish and English.

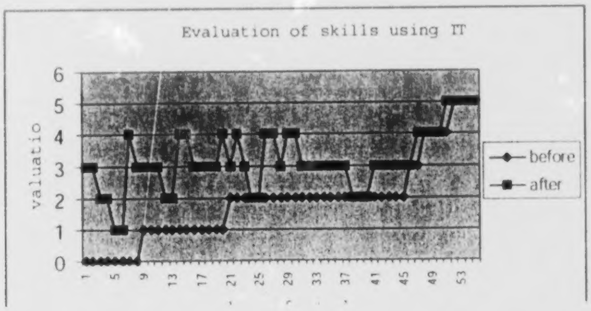
The course have the following content:

Computer Science and Computer Science Didactics develops basic skills using computers and work with Internet, awareness of use of possibilities (use of special computer program in certain subjects, distance education, life long learning through IT).

Attitudes – Values have orientation on values in the society, dilemmas of marked orientation, child and their development, gender equality, democracy, comparative analyses of equal/elite schools, attitudes towards drugs, alcohol and smoking, integration of pupils with social/mental and physical handicaps.

Teaching methods deals with integrated teaching subjects, interactive teaching, subjects methods, selection of material, project as a method and group work, teaching with integration of pupils with social, mental and physical handicaps (dyslexia). These three courses are linked towards each other.

There are 4 face-to-face two-days sessions for each group Latvian and Sweden when students have some lectures, practical works and group work. Two sessions are together for all participants (1 session in Vaxjo and 1 session in Valmiera) when students work in more larger groups – one or two schools from Latvia side and 1 school from Sweden side. All the time teachers organize and help the student learning. During the time behind sessions students cooperate using e-mails and small group work inside the school. Each session have been finished with a questionary about course evaluating, problems and benefits. One of the benefit is



rising teacher's skills using IT.

Table 1: Evaluation of student's skills using IT before the course starting point and after last session.

Conclusion.

As a result of questionaires we found some general inferences which can divide in two groups: student and teacher perspectives.

Student perspectives: 1)positive experience (learning becomes engrossing), 2)develops problem solving skills, critical thinking and cooperative learning, 3)in international groups language problem becomes inconsiderable, 4)if students take part in prepearing process then cooperative tools and communication becomes clearer, 5)students emphasize other learning tools not only books, 6)increase studying quality and versatility.

Teacher perspectives:1)learning process is going in both directions, teacher can teach and learn in the same time, 2)in preparing process all should be planned more detailed, 3)cooperating using IT shoud be test in various directions.

Vidzeme University College and Växjö University are open for cooperation with other universities; especially with existing universities and colleges involved in the two institutions' Nordplus and other European networks.

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REFORM IN GRADUATE SCHOOL TECHNOLOGY PROGRAMS

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Abstract: This paper presented a summary of research that was collected over a two-year period for the purpose of evaluating a graduate School Library Media Program. Reform in professional education programs that train school library media specialists provides opportunities to eliminate the disparity between job competencies taught and job competencies required by school library media specialists in their jobs. Because school library media services radically changed its emphasis at the end of the second millennium, from focusing on resources to students to creating a community of lifelong learners, it is essential that professional programs that train school library media specialists keep pace with current job demands. Program evaluation that lead to a redesign model which prepares graduate students for their roles as leaders and directors in today's technology-centered schools was needed.

Introduction

The changes that have occurred in society and the pervasiveness of technology during the past decade have resulted in massive changes in education and school library media programs. The functions of school library media specialists have been influenced by an emphasis on students and their learning. K-12 students look to their school for the content of knowledge and ways of accessing it made possible by advances in information technology. The American Association of School Librarians and the Association of Educational Communications and Technology advocated the creation of a community of lifelong learners that utilizes information literacy – understanding how to access and use information-- as the core element for achieving lifelong learners. Their model, *Information Power*, identifies three elements needed in library media programs: 1) learning and teaching; 2) information access and delivery; and 3) program administration (1998).

In a 1995 study (Karp), competencies needed by media specialists in media centers were summarized. Curriculum reform involved a systematic process of evaluation and redesign, which included an examination of the catalyst for change, an instructional model used to collect information on the existing program, data analysis and curriculum construction. The standards recognized nationally for school library media programs are *Information Power*. The current edition of *Information Power* (1998) identifies three major elements of the library media program reflective in the library media specialist's role: learning and teaching, information access and delivery and program administration. Included in Information Power is the Information Literacy Standards for Student Learning and serves as the foundation for effective library media programs. These Standards firmly establish the library media specialist as an essential partner in fostering student learning. The role of the professional is one involving collaboration, leadership and technology—the unifying themes for partnerships in the information age (Maney, 1998).

The question that we asked ourselves was to what extent was our professional program preparing our graduates to assume the partnership roles in learning that *Information Power: Building Partnerships for Learning* identified? Woodruff (1994) suggested that school library media specialists who had been out of school for longer periods of time than recent graduates needed more up-to-date competencies on the job more often. Were we producing graduates who could fulfill the role of partner in teaching and learning, information access and delivery and program administration? Where in our program could we document authentic experiences that would allow students to observe and model the necessary knowledge, skills and abilities?

The research described in this paper sets out to evaluate our current program using a collaborative perspective. It further details the methods used to collect and analyze data from our major stakeholders throughout the state. And finally it presents a curriculum design model for our school library media program that will support our national and state standards, and therefore provide the foundation for building and sustaining partnerships for learning.

Background of the Study

The Graduate Program in School Library Media is currently the largest provider of certified school library media specialists in the state. The program attracted excellent student graduates who now serve as leaders in their schools, districts, and in the state. Because the program began in 1974 and had not undergone systematic revision, this evaluation was warranted. New courses have been however, instructional design principles have not been applied across the board. A total redesign was needed to meet the needs of school library media leaders for the 21st century. The program needs to provide the foundational, technical and instructional knowledge that graduates will need to continue to be leaders across the state. Based upon the model recommended, graduates will be able to effectively shape schools for the next generation of students in K-12 settings.

The goal of this project was to evaluate the current graduate program in School Library Media and to revise it based upon evidence from the data collected. To accomplish this goal several steps had to be undertaken: 1) an analysis of the current program; 2) data collection from the primary stakeholders reflecting their job performance of SLM specialists; 3) an analysis of the data; 4) a re-evaluation of the program in light of the data analysis; 5) implementation of recommendations as a redesign of the curriculum.

Research Methods

There are early indications that establishing collaborative teams can have great potential for affecting change in the way we introduce innovation to the system (Wagner, 1998). To begin the process of evaluation of the program, faculty in the Instructional Technology Program examined the objectives of each course and identified *The Information Literacy Standards for Student Learning*, which were evident. These standards were promoted in course syllabi, official documents and the faculty/college web sites, along with the core standards of other departments (Wolcott, et al. 2000). This process was completed during our preparation for NCATE 2000 accreditation.

The next step was to seek the expertise assistance of an instructional developer who provided guidance in instrument development and selection, data collection samples, and data analysis. The instructional designer tested and validated the Holland Priorities Model (HPM) Instrument (Holland, 1996) to identify specific workplace abilities performed by school library media specialists.

Three major stakeholder groups who benefit from the knowledge, skills and abilities of job competencies performed by school library media specialists were identified as samples for administering our instrument. They included: principals from school systems who hire our graduates, school library media supervisors who train, manage and evaluate our graduates, and our graduates themselves who have studied, graduated and have accepted professional positions as school library media specialists across the state.

The first sample consisted of school library supervisors who have the primary responsibility of providing leadership for school libraries across the state. Their expertise and reputation within the field made them primary candidates to serve as panel members of the School Library Media program design advisory committee.
They were informed that our goal was to totally redesign our program. The instructional designer served as facilitator for the sessions because she was not known to any of the panel members and could be less subjective in her presentation.

They were invited to our campus to spend a day meeting with our team of investigators. The first task assigned to these experts was identifying workplace abilities and skills exhibited by current employees in school library media centers. This was an individual activity performed by each participant. This activity was followed by a briefing provided by each panel member based upon his or her responses on the *HPM Workplace Abilities Instrument* (1996). This activity was followed by the identification of topics and issues that are apparent in school library media programs and services. Two other surveys were administered and generated data: a *Workplace Attributes Survey* and a *Grass Roots Panel Identification Survey*. These surveys allowed the panel to list attributes they had observed performed by media specialists as well as to identify outstanding administrators who have collaborated with school media specialists and could provide another perspective on the job competencies performed by media specialists. All of these instruments provided qualitative data that was analyzed in the study.

The second sample included graduates of the program (alumni) who are now practicing school library media specialists in K-12 settings across the state. This sample provided an insider's perspective on the program that reflected knowledge, skills and abilities gained while in the program. The same data collection format that was used for the first panel was also used here.

The final sample was made up of superintendents, principals, assistant principals and supervisors from across the state. The results of a study reported by Wolcott (1999) concluded that pre-service teachers place more emphasis on those functions associated with information access and delivery than those related to learning and teaching. Veltze (1992) suggested that programs that prepare principals should include information on school library media programs in order to change negative attitudes of principals concerning libraries. This sample was selected because of their participation in the Maryland Technology Academy, Summer 2000 program, and their support and interest in technology in schools and libraries. The same procedure used on the two previous samples was used here.

At the conclusion of the session each panel member provided an evaluation of the session. They were asked the following questions: 1) How would you rate the value and quality of the session? 2) What are your ideas on how the session could have been of higher value/quality? 3) What was the most valuable or important aspect of the session? 4) What would you say was the least valuable or important aspect of the session? 5) What are your ideas on how we could better match students' abilities with workplace needs? 6) Would you want to be involved in future initiatives with our institution?

Discussion

The responses from the HMP Workplace Abilities Instrument are currently being analyzed using Microsoft Excel software to determine the abilities, which had the highest priority among all panel members. The topics and issues are being analyzed to determine commonalities that may suggest priority competencies, which should be included in the program. These topics and issues may also suggest units of instruction that should be added to courses or new courses that will need to be designed to meet workplace demands and/or national standards.

Based upon the analysis of this data, the current program will be evaluated to determine what abilities and skills are evident in current course offerings. Courses, which are not currently providing these abilities and skills, will be targeted for deletion and revision. Topics and issues will be identified as a method of determining what new topics should be included in the curriculum as well as those that were not identified as relevant. From this evaluation a new program model will be recommended, developed and implemented.

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Brazilian National Computer Program for Education and its Contribution to a Constructivist Educational Process

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Abstract: The current study aimed to evaluate the 'Computer Course Applied to Education' addressed to teachers from Brazilian public schools and offered by PROINFO (National Computer Program for Education). The analysis was developed through a case study model and the used research technique was 'Illuminative Evaluation' (Parlett, 1990). Three categories (Cooperative work, Autonomy and Suitability) and their indicators were separately observed and evaluated throughout the three stages of the course. The analysis of frequency evolution throughout the course demonstrated a progressive rise of category occurrence. "Cooperative work" was identified in 75% initial observations and 91.6%, towards the end. The same happened to "Autonomy", increasing from 59% to 91.6%, and "Course suitability", from 70.3% to 94.4%. Through the analyzed data, it was attested that the educational computer course offered by PROINFO in NTE II/RJ could stimulate the adoption of a social-interact ional and constructivist attitude by the teachers, concerning their pedagogic practice.

Introduction

The current study aimed to evaluate the 'Computer Course Applied to Education' addressed to teachers from public schools and offered by PROINFO (National Computer Program for Education), attempting to promote a social/interact ional and constructivist teaching-learning attitude.

PROINFO intends to begin a process of generalizing the use of technology in the Brazilian public school system. In order to assure that the significant sum invested will be efficiently applied, it is necessary to emphasize human training that comes before hardware installation. Demanding physical structure and technical support for running the equipment are also required.

The training of public school teachers in Brazil has happened through NETs (Educational Technology Nucleus), which are decentralized structures to support the process of computer implementation with their basic functions described in the principles of PROINFO.

A profile of how a teacher, trained by the NETs, should be was defined as: autonomous; cooperative; creative and critical; committed to constant learning; more concerned in teaching the students how to learn than merely taking care of didactic matters; engaged in forming individuals prepared to deal with the complexity of taking decisions and the consequent responsibility; able to establish a pleasant relationship with interchange practice (Ministério da Educação e do Desporto/ Secretaria de Educação a Distância , 1997, p.12). These goals are based on theoretical constructivist and social-interact ional preconceptions, assuming that if a teacher can experience these concepts during his/her formation, it will enable him/her to incorporate them in education praxis.

According to Piaget, knowledge cannot be conceived as a predetermined matter since birth (innatism), neither as the result of simple records of perceptions and information (emmpirism). It results from actions and the interplay between the subject and the surrounding environment. Knowledge is a construction that begins during childhood, through the interactions between the subject and what he/she wonders about, both from the physical and cultural world.

Therefore, knowledge is never a passive copy of reality. Intelligence develops through action and the teacher should promote and nourish this progress by the creation of suitable opportunities, and not by teaching methods that tells you what to do and learn. Knowledge results from an inter-relation between the subject that knows and what is been investigated (Macedo, 1994).

There is an active subject, during all ages of life, who searches to know and comprehend the surroundings. Nevertheless it does not happen immediately, through simple contact with the objects. Its possibilities come from what Piaget called of assimilation or action (agitate, suck or rock) schemes; or even mental operations (gather, separate, classify, establish relations), which are actions as well but take place in the mental plane.

Piaget classified as accommodation the mechanism of rising or modifying of an assimilation scheme. The assimilation and accommodation contents will vary during the process of cognitive development, however the intelligent activity is always an active and organized process of adding what is new to what have been already built up, and vice-versa.

On the other hand, the adapting process is completed by successive approaches, connecting assimilations and accommodations. After each adaptation, the new assimilated scheme becomes structured and available for the subject to accomplish other accommodations and, so on.

The central concept of constructivist theory, called the "balancing process", is what promotes this movement.

Facing a challenge, an incentive, a lack in the knowledge, the subject becomes intellectually uneven, gets curious, motivated and, through assimilations and accommodations, tries to establish a dynamic balance for it is achieved by physical and/or mental actions (Piaget, 1990).

According to Vygotsky, we are able to identify three central ideas: (a) the psychological processes have their origin in social processes; (b) the mental process may only be understood through the comprehension of the used mediators; (c) the belief in the genetic or evolutionary method.

It is important to remark that the author does not study the human development separated from its social-interaction's environment. Therefore he integrates social, semiotics and psychological phenomena in one concept. Besides, he accomplishes the analysis of the origins and the process that leads to a determined subject state, which is always dynamic.

Vygotsky remarks the complex transformations that structure human development such as appropriation and transformation of culture and defines the individual ontogenesis as a sequence of important events that happen simultaneously and as a result of social life. Throughout the process, the main concern is to explain the psychological phenomenons as consequences of genetic changes during child development, and therefore considering social environment and culture as foundations. According to the social-interaction's perspective, child development process is placed on the interface (border, boundaries) and convergence of cultural and maturing processes existent in this development, as the subject psychological system becomes the environment where biological adaptations turn to social relations. The individual is born in a cultural context historically structured, with artificially incentive meanings and complex social relations that mediate the active development during interactions. Vygotsky states that subject development is the product of social institutions and educational systems, such as family, school, church, which help to elaborate his/her ideas/thoughts and discover the meaning of somebody's actions and his/her own.

People generally adopt the rule that learning should be even with the evolutionary level of the child, and in order to do so, several stages are established, for reading, writing, etc. There is also the supposition that the child's capacity does not go beyond of what he/she is able of doing by him/herself. However, Vygotsky says that, if we want to check the relations between the evolutionary process and the learning abilities, we must define at least two evolutionary levels: the "real development level", or the *"development level of child mental functions, established as the result of determined finished evolutionary cycles"* (Vygotsky, 1998, p.131), or in other words, what the child can do all by him/herself; and a second evolutionary level, the "potential development level", which is formed by the activities that the child can achieve only if helped.

Generally, tests that indicate child mental age relate to the real level, while Vygotsky affirms that what children are able of doing with the help of others may be more significant to their mental development than what they can do by themselves.

After establishing the two evolutionary levels, Vygotsky defines the "proximal development zone" as the distance between the real development level and the potential development level (determined by solving a problem helped by an adult or a more capable classmate).

While the real development level defines functions that are already mature, or the final products of development, the proximal development zone defines the "unripe" ones, the functions that are becoming mature and that will be completely structured in the future.

According to Vygotsky's theory, the mental development level of a person can only be determined if the two development levels are considered and cleared up: the real and the potential. Consequently, both the conception of comparing the development level and the learning process, and the idea that only what the child is able of doing by him/herself is indicative of mental capacity are denied.

The concept of proximal development zone must be highlighted as a significant intellectual tool, which allows the comprehension of personal inner development and also predictions of some functions that will be mature in the future. It is a conception capable of improving the use of diagnosis of mental development in educational problems.

We have arrived to the conclusion that, to Vygotsky, the *good learning process is the one that precedes the development* (Vygotsky, 1998, p.92), meaning that, evolutionary processes are not similar to learning processes, but the evolutionary process is stimulated by the learning one, which turns gradually into development. That is why internalization is the key-concept in Vygotsky's theory, which means that for a person to achieve his/her individual goals, it is necessary to go through a learning process that must be internalized. Therefore, the instruction on the proximal development zone stimulates the child's activity, prompting the whole development processes, which, after internalized, change the functions that the child is able to do by his/herself.

Based on the theoretical conceptions of these two authors, it is assumed that the students learn and develop as they elaborate suitable meanings about the contents of the school subjects. This construction includes the student active contribution; his/her availability and previous knowledge, taking place in an interactive context, in which the teacher acts as a guide, a mediator between the child and the culture. The success of the learning process will strongly depend on this mediation. The learning process is focused on relevant contents and also related to the student context and routine, considering that he/she has a previous knowledge, result of one's experience, which will be enriched with new contents.

The pedagogic praxis should then stimulate the student to product and think about his productions. Instead of answers, the teacher should propose questions that promote the student construction of his/her knowledge, experimenting and registering the results. The role of the teacher should be of a challenger and stimulator of new discovers instead of mere knowledge provider. It is not expected from the teacher to know all the answers, but to suggest ways to find them.

The challenge of rethinking the role of the teacher is related to redefining the computer role as a pedagogic device/tool, as an addition to create an environment that provides knowledge construction and creative activity of students and teachers.

Based on these indicators, we can state that changing the pedagogic practice depends on continued schooling (academic qualification), as well as on an interdisciplinary perspective in qualification services offered to educators. Through this new profile, the teacher will help the students to be creator agents, capable of abandoning passivity, not acting like simple knowledge receivers.

The academic qualification of the teacher should provide conditions for him/her to construct his/her own knowledge about computer techniques, to understand why and how integrate these methods to education practice and to overcome administrative and pedagogic matters. This practice promotes a transition from a fragmented school system to an integrationist approach of the contents, focused to finding solutions to specific problems relevant to the students, raising their interest. Finally, there should be conditions for the teacher to know how to contextually situate what was learned and experienced during his/her academic qualification to classroom reality, making the student demands and the pedagogic objectives of the teacher more compatible.

Considering how relevant and widespread PROINFO has become, it is really eminent to evaluate its results, verifying the attitude of the trained teachers.

Method

The simple consisted of eight public school teachers from the city of Rio de Janeiro, selected to be trained by the 'Computer Course Applied to Education', offered by NET II/RJ. There were teachers of different subjects in the class, promoting interdisciplinary.

The analysis was developed through a case study model and the used research technique was 'Illuminative Evaluation' (Parlett, 1990).

The procedure had the following stages: (1) "Immersion": the initial part, when the observer-analyzer immerses in the environment to be evaluated with two objectives: (a) acknowledge the different aspects and (b) obtain initial data for future indicators of changes that the program might promote; (II) "Dive": the collected indicators are now analyzed and verified their occurrence through behavior manifestations, called "impact evidences"; (III) "Triangulating": the information data, collected differently by the observers are then confronted.

Results

The data gathering and its organization occurred as it follows: (a) all indicators were registered; (b) indicators were grouped according to their nature (cooperative work, autonomy, course viability); (c) specification of "impact evidences"; (d) a table demonstrating the students performance; (e) analysis and discussion of the results.

The three categories and their indicators were separately observed and evaluated throughout the three stages of the course (40 hour length each).

Category I - Cooperative Work

It was detected when the group became united and active through sharing and participation. A few indicators were evaluated: (a) appreciation of group work; (b) student/student relationship; (c) appreciation of work in pairs.

Concerning "appreciation of group work", some small problems were observed right in the beginning but they were overcome and replaced by cooperation, respect and participation.

The "student/student relationship" showed that the pairs were quickly drawn. However, these pairs became stable which made the interchange of elements more difficult. Trading partners would allow a better interplay, although the stable pairs did not prevent the occurrence of interpersonal relationship involving the entire group.

A positive aspect of the indicator "appreciation of work in pairs" was the acceptance of challenges proposed by the other partner. Even if an element knew more than the other, it did not promote competition. On the contrary, it improved, enriched their work, acting on their 'Proximal Development Zone' (Vygotsky, 1998).

Category II - Autonomy

The indicators were (a) solving problems individually; (b) solving problems in pairs; (c) critical ability; (d) creation through *Logo*; (e) construction of texts.

Relating to the two first indicators, the group was able to solve their problems, both individually and with a partner, creating alternatives to figure out some questions, gather and analyze information, besides discussing suggestions brought up by the instructors.

According to Piaget (1977), in order to overcome heteronomy, which means acting or judging something without questioning its values and principles, a person needs to be encouraged to develop his/her own values. Concerning critical ability, it was observed that the teachers had the chance to gather, organize and evaluate relevant information, struggling to reach autonomy.

The indicator "creation through *Logo*" demonstrated that the childlike atmosphere, involved in this kind of activity, promoted some creative moments. Playing with the turtle, for instance, eased the learning process and the project construction, turning the natural fear to make mistakes into a feeling of challenge. The students' growth may be verified through the recorded programs, in which they were gradually able to create sophisticated drawings from rough sketches. The whole creative process that preceded the final product was even more pertinent to the project. According to Piaget, the main focus should be the action of discovering and thus the process much more valuable than the product.

"Text construction" showed that, through the discussions of different material, the students could relate what was being read to their pedagogic practice, improving the texts written by the group.

Category III - Course Viability

Three indicators were drawn: (a) suitability to constructivist principles; (b) acceptance of course proposal by the student-teachers; (c) gradual learning of the material.

In relation to "suitability to constructivist principles", the course allowed the students to evaluate the role of "errors" in the teaching-learning dynamics. It seems that a teacher's profile generally follows a pattern of strict responsibility, not admitting "attempts" or "mistakes". As errors were diagnosed and new tracks to the right answer were revealed, the belief of an autonomous an active subject was then adopted.

The indicator "acceptance of course proposal by the student-teachers" had a rather satisfactory response. Despite their initial ignorance of the course proposal, the students got really engaged in the activities, making suggestions and enriching their work.

Through "gradual learning of the material", it was observed that there was a substantial knowledge acquisition by the students, considering that most of them had never dealt with computers. Nevertheless, by the end of the course, they were able to understand the new language and could develop computer activities in a much more autonomous way.

During each stage of the course, eight teachers were observed through eleven indicators previously described (three from "Cooperative work" category, five from "Autonomy" and three from "Course Suitability"). The indicators were then evaluated according to their frequency: "often" (3), "not often" (1) and "never" (0). The performance of the teachers was calculated through pondered sum of each indicator which could reach a maximum of 24 scores, if all teachers received "often". Categories such as "Cooperative work" and "Course suitability" could have a maximum of 72 (24 x 3) scores and "Autonomy", a maximum of 120 (24 x 5). The following step was to calculate the percentage of the group for each category.

The analysis of frequency evolution throughout the course demonstrated a progressive rise of category occurrence. "Cooperative work" was identified in 75% initial observations and 91.6%, towards the end. The same happened to "Autonomy", increasing from 59% to 91.6%, and "Course suitability", from 70.3% to 94.4%.

Categories	Stage I	Stage II	Stage III
Cooperative Work	75%	86%	91.6%
Autonomy	59.7%	81.9%	91.4%
Suitability	70.3%	76.3%	94.4%

Table 1: Percentile evolution of the categories throughout the course

Conclusion

Through the analyzed data, which indicated a rise of some categories such as "Autonomy", "Cooperative Work" and “Suitability”, it was attested that the educational computer course offered by PROINFO in NTE II/RJ could stimulate the adoption of a social-interact ional and constructivist attitude by the teachers, concerning their pedagogic practice.

Concluding so, we recommend the promotion and extension of similar training programs; the maintenance of training services for teachers; an annual diagnose of how the professionals are adapting to new working proposals and the development of researches about inserting new technology in the school environment.

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Integrating ISTE & NCATE Standards into Educational Technology Masters Programs

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Abstract

Abstract: Educational Technology Masters programs are coming of age! The International Society for Technology in Education (ISTE) has published a five-step blueprint outlining the curriculum standards requirement for all advanced programs in educational computing and technology (ECT) leadership. This paper briefly examines these standards and explains how they've been recently interpreted for all future Ed. Tech.-related Masters courses at Sonoma State University (SSU).

The ISTE & NCATE Advanced Programs Standards

The National Council for the Accreditation of Teacher Education (NCATE) is a powerful body, which is influencing the design of most teacher preparation and professional development programs across the US. Many departments of education in individual States – including California – across the US have signed voluntary agreements with NCATE to recognize reform of their current programs' in-line with NCATE's standards. Within this framework NCATE has included a set of specific program standards for all educational computing and technology courses. These have been defined by the ISTE and adopted by NCATE for all courses intended for the initial and advanced preparation of teachers.

For advanced in-service teacher training leadership courses at the Masters level within the field of educational computing and technology literacy (ECTL) these standards have been summarized and abridged in Table 1. A good example of how these ECTL standards are manifested into the school curriculum and employed by students is given in the joint ISTE and Milken Exchange publication entitled: National Educational Technology Standards (NETS) for students. Both this document and another entitled National Educational Technology Standards (NETS-T) for teachers are available as PDF download files from the ISTE and NCATE Websites, which are given in the reference section at the end of this paper.

The ISTE advanced leadership standards for Ed. Tech. require completion of a five section syllabus. Sections 1 to 3 of this ISTE standards syllabus represent prior learning Ed. Tech. skills and experiences that need to be accredited before a candidate can proceed to sections 4 & 5. Sections 1 to 3 describe Ed. Tech. field practices that closely relate to the ECTL standards required by teachers achieving the NETS-T accreditation. Thus, sections 1 to 3 of ISTE's Ed. Tech. leadership curriculum could be satisfied by a pre-requisite qualification based upon the jointly accredited (ISTE/NCATE) NETS-T program. Ed Tech leadership Masters courses could then be designed upon sections 4 and 5 and the next section of this paper describes the current proposals being considered for implementation at Sonoma State University (SSU).

ISTE's 5 sections	Pedagogic abstract

1) Foundations – ECTL matrix	Prerequisite ECTL skills and knowledge must be both audited and provided for as a prior learning course.
2) ECTL Specific Content	Can also be audited against the ECTL matrix with coursework evidence demonstrating the use of technology to support other curriculum content areas.
3) Professional Preparation in ECTL	This requires candidates to be able to practically integrate ECTL pedagogic methodologies into the school curriculum.
4) ECT Leadership studies	Requires candidates to summarize ECTL-related pedagogic research and contemporary trends in schools. Candidates must also design an authentic research project that evaluates a specific technology used in a PK-12 environment. Candidates must also be involved in instructional design and courseware development using appropriate authoring and graphical software environments. Information and Communications Technology (ICT) environments are also to be explored, i.e. using the transmission of multimedia systems via institutional networks as a presentational tool. In addition to this, candidates are required to be conversant with stand-alone and networked operating systems and be able to identify/manage/troubleshoot suitable software and hardware procurements for both the classroom and administrative environments.
5) Professional preparation for ECT Leadership	Candidates require studies of and experiences with leadership, staff development and supervisory concepts and skills as they relate to the use of technology-based systems in PK-12 education. This will include the unique design of curriculum Ed. Tech. master plans and policy documents based on national/state/local guidelines along with policies related to resource management. Integration of technology tools into teaching must be demonstrated both personally and through the design of staff development action plans to achieve the same. A research project related to achieving and managing change within the school district is also required, as are field experiences that document the change-management process of unique ECTL reform programs.

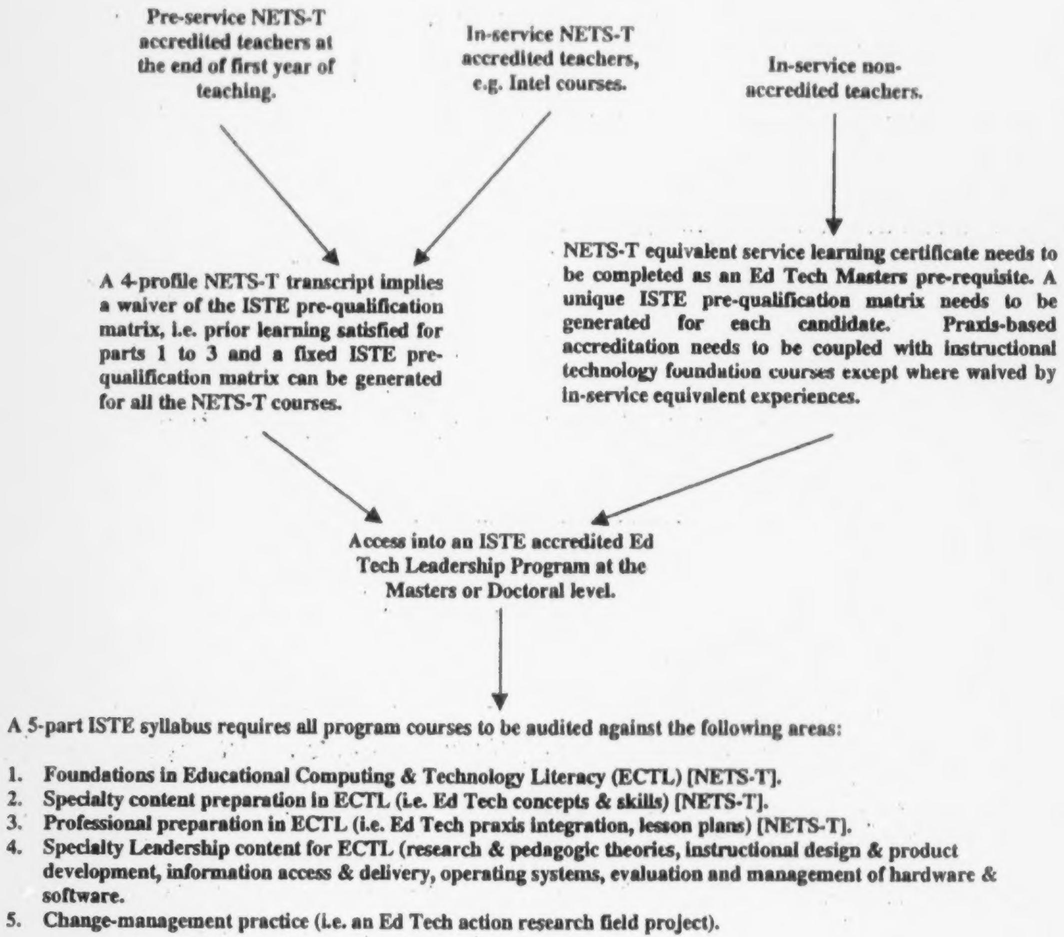
Table 1: Interpretation of the ISTE advanced leadership standards for the educational computing and technology literacy (ECTL) matrix.

Interpretation of the ISTE standards for Ed Tech Masters Courses at SSU

At Sonoma State University it has been my task to interpret the ISTE standards and propose four new courses that can be offered as a 12-unit major, or emphasis, within the regular educational MA program in curriculum, teaching and learning (CT&L). The two key problematic issues identified that would affect the design of any Ed. Tech. Program at the Masters level were:

1. Prerequisite evidences and ECTL accreditation;
2. The clinical practice and community-based supervision and assessment requirements.

The ISTE organization requires that "As a prerequisite to the advanced program, candidates must document knowledge and competencies contained in the Educational Computing and Technology Literacy matrix." (see the advanced leadership guidelines on the Website reference given in this paper). The solution proposed at SSU in order to satisfy these prerequisite ECTL evidences cited in problem (1) was to develop the ISTE standards as a set of curriculum planning learning objectives within our own version of the ECTL matrix. From this matrix we can determine the prior learning entry-level qualifications of all candidates entering the Ed. Tech. Masters program. Previous Ed. Tech. related in-service training courses can be assessed and accredited against the matrix, with any identified deficits accounted for with specific top-up programs. Work is currently under way in developing a common-access transcript that automatically accredits all existing and new Ed. Tech. related staff development in-service training courses within the SSU district. Other Ed. Tech. related courses offered at the pre-service qualification level can also be accredited with the same standards. Indeed, the eventual goal is that all teacher trainees graduating from SSU meet the ISTE's ECTL matrix. A flowchart describing these various Ed. Tech. training routes for both pre-service and in-service teachers is given in figure 1 below.



Pre-service NETS-T accredited teachers at the end of first year of teaching.

In-service NETS-T accredited teachers, e.g. Intel courses.

In-service non-accredited teachers.

A 4-profile NETS-T transcript implies a waiver of the ISTE pre-qualification matrix, i.e. prior learning satisfied for parts 1 to 3 and a fixed ISTE pre-qualification matrix can be generated for all the NETS-T courses.

NETS-T equivalent service learning certificate needs to be completed as an Ed Tech Masters pre-requisite. A unique ISTE pre-qualification matrix needs to be generated for each candidate. Praxis-based accreditation needs to be coupled with instructional technology foundation courses except where waived by in-service equivalent experiences.

Access into an ISTE accredited Ed Tech Leadership Program at the Masters or Doctoral level.

A 5-part ISTE syllabus requires all program courses to be audited against the following areas:

1. **Foundations in Educational Computing & Technology Literacy (ECTL) [NETS-T].**
2. **Specialty content preparation in ECTL (i.e. Ed Tech concepts & skills) [NETS-T].**
3. **Professional preparation in ECTL (i.e. Ed Tech praxis integration, lesson plans) [NETS-T].**
4. **Specialty Leadership content for ECTL (research & pedagogic theories, instructional design & product development, information access & delivery, operating systems, evaluation and management of hardware & software.**
5. **Change-management practice (i.e. an Ed Tech action research field project).**

Figure 1: Flowchart for Ed Tech leadership courses with ISTE accreditation

The second big issue identified in problem (2) is to meet ISTE's practice standard, which envisages participants' engaging in technology-based educational research and curriculum development leadership programs within, say, a teacher's local school district. One way to deliver Ed. Tech. related clinical practice of this complexity is to go down the route of accrediting Ed. Tech. curriculum reform

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projects within an action research cycle and have these form the basis of a Masters dissertation project. Action research project management methods are considered to be a well-suited tool and approach for enabling authentic curriculum reform practice. Stenhouse (1975) argued that a curriculum was an attempt to communicate the essential principles and features of an educational proposal into a form that it is open to critical scrutiny while being integrated into practice. Indeed, Elliot (1991) corroborates with this view and tells us that action research is a good tool for professional personal development as it encourages us to reflect on our actions. Elliot interprets action research pedagogy as a set of practical steps that can guide teachers in transforming educational aims into classroom practice. The action research praxis and pedagogy appear to be in-tune with the ISTE aims for advanced leadership Ed. Tech. programs. In particular, the ISTE Ed. Tech. Leadership matrix in section 5 (See document on ISTE's Website) requires candidates to be involved in an assessment project that constitutes as part of an Ed. Tech. change-management process within an educational and/or training institution. The ISTE standard 5.6.3 requires all candidates to be involved in a practical Ed. Tech. field study evaluation project:

5.6.3 document and assess a significant field-based activity involving experiences in instructional program development, staff development, facilities and resource management, or managing change related to technology use in schools.

Given the above ISTE provisos and the criteria interpreted in Table 1, we are now developing the following range of ISTE-related courses as a special track within the Ed Tech major of the CT&L Masters program at SSU and these are summarized in Table 2 below.

Ed Tech area of emphasis (AREM)

Title	Units
Learning theories and the societal impact of technology	3
Organizational management of information and communications technologies across the curriculum	3
Instructional design & technology	3
Project management methods for Ed Tech professional development	3
Total:	**12**

Ed Tech ISTE pre-requisite qualification

Title	Units
Service Learning Certificate: NETS-T ISTE pre-requisite	3
Total:	**3**

Table 2: The proposed ISTE-related Ed Tech Masters courses at Sonoma State University

The first three courses will operate as traditional university-based courses; however, the aim is to develop the final course "*project management methods for Ed Tech professional development*" as both part-course and part of an action research field study dissertation project.

Conclusion

In conclusion I would recommend that all Ed. Tech. Masters program developers that wish to incorporate the five ISTE leadership standards from the ECTL matrix adopt similar pedagogic strategies to those being proposed at SSU with particular emphasis on the following:

1) An ISTE pre-requisite based upon the current NETS-T standards, which can be accredited against actual Ed Tech field practice and other relevant previous Ed Tech in-service training experiences.
2) A practical field-based work project and/or study based upon action research evaluation methods.

Recommendation 1 is targeted at all applicants wishing to join an ISTE accredited Ed Tech Masters program. An innovative service learning 3-unit accreditation course is being developed at SSU that aims to achieve the following goals:

⇒ accredit and validate all existing on-the-job (field-based) Ed Tech praxis and relevant in-service training experiences;
⇒ top-up any identified skill shortfall from the ISTE pre-qualification matrix (sections 1 to 3) with a tailor-made Ed Tech service learning program to be located within the candidates own place of work, i.e. school or any other training establishment deemed pertinent to developing leadership skills; and,
⇒ provide an interim SSU certificate granting completion of the ISTE matrix preparation areas, i.e. an official transcript accrediting the ISTE syllabus sections 1 to 3 in Table 1.

Recommendation 2 aims to give Masters thesis accreditation to Ed. Tech. management projects that stimulate change-management curriculum reform practice from within the candidate's field of work. This Masters program *real-life* design issue was also raised by Tom (1999), who reported that: "Teachers dislike these (Educational Masters) programs. They view them as detached from the daily practice of schooling" (p. 245). This suggests the potential professional merit of implementing a practice-based Master of Education and/or Arts Ed. Tech. program that addresses professional teacher development needs through accreditation of field-based action research curriculum projects.

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Growing the Learning Landscape: Experience in Environment and Process

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Abstract: Teachers are faced with implementing technology provided without consultation, often without consideration of the infrastructure, much less the technical or curricular training necessary to make full use of it. Too often we focus our attention on the Mountains of Technology forgetting that landscape is more than just the one prominent feature; it encompasses the Streams of Curricular Change, the Evergreens of Knowledge, the High Plains of Critical Thinking, the Safe Arbors of the Community. Through all this rich environment blow winds of administrative, political and social change that can make barren former gardens of thought and pile rich soil in new areas. Should we as teacher educators help them scale the mountain to obtain a different perspective or encourage them to skirt around, treating the intruder as a stumbling block to their journey and as eyesore that hides and overshadows part of the landscape? What follows is a descriptive case study that examines one university program's attempt to resolve apparent disparities between the learning and integration of technology into K-12 environments.

Genesis

Teachers are faced with a mounting dilemma in this rapidly evolving Age of Information. They are urged, cajoled, pleaded with and threatened to include technology into their curricula. Administrators, politicians, curriculum experts, scientists and corporate America rally around a range of beliefs that locate technology as a central piece in curing the ails of what-is-touted to be an intellectually and near economically bankrupt public education system. School districts open their curricular arms to embrace comprehensive programs of technology—often to the bewilderment and bemusement of in-service teachers who must integrate this technology into an existing curriculum that in some cases is already held together with string and sealing wax. Teachers know, because they live in a world becoming filled with ubiquitous technology, that technology is here to stay—it is changing the way the world communicates, transacts business, socializes, and expresses itself artistically. However, teachers are faced with implementing technology provided without consultation, often without consideration of the infrastructure, much less the technical or curricular training necessary to make full use of it.

Too often we focus our attention on the Mountains of Technology forgetting that landscape is more than just the one prominent feature; it encompasses the Streams of Curricular Change, the Evergreens of Knowledge, the High Plains of Critical Thinking, the Safe Arbors of the Community. Through all this rich environment blow winds of administrative, political and social change that can make barren former gardens of thought and pile rich soil in new areas. What we often perceive as static, unchanging and permanent is in actuality, constantly changing.

What value then teaching *current* technology skills for their own sake, in isolation, with no thought of need or purpose? How can in-service teachers learn current technology skills and the principles of their implementation, and how can those skills and principles enhance and expand and evolve public school curriculum. As teachers and students work together in growing a learning landscape how do they react to the sudden appearance of a mountain from without? Do they scale the mountain to obtain a different perspective or do they go around, treating the intruder as a stumbling block to their journey and as eyesore that hides and overshadows part of the landscape?

In a better model learners are in the center of a systemic developmental process in which they, their knowledge and knowledge of processes interact through the community—classroom, local and exponentially more global, informed through continuous ongoing feedback to provide a more organic experience. This model serves as a weathervane, informing principles upon which we can design, construct, and adjust to the changing environment of economic, social and political influences. They form, in a mutable world, constants. The guiding question is how do higher educators, who work with a pre and post service teacher population, provides an environment that exemplifies, illuminates and encourages transfer of this organic process?

Geology

In 1998, Sam Houston State University had in place an M.Ed. degree program with an emphasis in instructional technology. Several characteristics of the program conspired to keep the number of active interested graduate students lower than it could otherwise be including the course sequence, the dispersion of the graduate population through the program and the reliance on independent study with already overloaded faculty. In consequence those graduates enrolled in the program were subject to a particular instructional experience in which they functioned semi-independently of both the supervising faculty member and of other students in the program. With many graduate students also managing home, family and work responsibilities, the experience tended to be a lonely and isolated one with little opportunity for social and academic support.

In an attempt to manage the enrolment situation, the researchers decided to implement a cohort system for the program. The students would start the program together and progress through a predefined sequence as a closed community. Of course cohort members could still take courses through independent study if the need arose. Having made significant changes to the structure and sequencing of the program it became obvious that the nature of the student experience was going to radically change. This gave the researchers the opportunity to proactively engineer the student experience to enhance student performance, the education process, and the support system.

Geography

People learn by using existing schemas to construct new understandings by assimilating new ideas into existing schemas or accommodating existing schema to encompass concepts that completely alter their current conceptions. (Piaget) It becomes important for educators in the university environment to come to know the population they teach—their beliefs and the context of community and cultural values which encompasses those beliefs, so that they can illuminate existing student schema in order to build on students' strengths, shore up their misconceptions or weaknesses in order that they may construct new understandings. These understanding while examined in the relative isolation of the college classroom must be able to go into the schools and communities of the teachers and become part of an organic process of knowing theory, enacting theory into practice, reflecting on that practice, and reformulating theories are principles—praxis.

With a sense of praxis existing within teachers, they can not only extend what has been learned in one context to new contexts (Byrnes, 1996, p.74) but they have the ability to not only contribute to the practice that replicates the transfer of this knowledge, but to contribute to and or extend the theoretical principles which underpin it. It becomes imperative that pre and in-service teacher instruction in technology integration be learner centered, knowledge centered, supported by authentic assessment, and grounded in the context of the communities which it will be practiced.

This research is a descriptive case study that examines one university program's attempt to resolve apparent disparities between the learning and integration of technology into K-12 environments. Data sources which inform the researchers' understandings are: course syllabi, interviews with students and professors, threaded message boards from course work, class debriefings, and student projects and products and interviews with building principals from the informants' schools. The informants in this study include two university professors, eleven K-12 classroom teachers enrolled in the cohort masters in educational technology program, the university students' classrooms from the fall of 1998 through the spring of 2001.

Working from a problem-centered, real-world perspective integrating multiple forms of knowledge and knowing, the study attempted to use technology transparently, focusing on its value as a tool in the problem solving process rather than on technology as a body of extant knowledge.

This data, while purely descriptive, is analyzed for recurring patterns examining the organic process of how students assimilated/accommodated theory, enacted theory to practice inside the college classroom and then transferred or extended it into their own classrooms in communities. Information gleaned from examination of this descriptive analysis is meant to inform the professors in this study, and is brought to the larger academic community for further discussion.

Surveying the Terrain

Traditionally education has been representative of its geographic social, political and cultural environs. Also traditionally education has assumed there is a fixed body of knowledge that can be transmitted from educators to learners. More recent views [Vygotsky, Foucault, Berenfield] recognize that knowledge is transmitted, analyzed, and in many cases, transmuted so quickly that it is continually evolving. No longer, can knowledge be thought to be a static entity dispensed by educators. Instead now, many educators believe that thinking "takes place in communication, in an act of knowing in which the learner assumes the role of knowing subject in dialogue with the educator" (Freire, 1988, p.403-404). Learning is collaboration between students, educators, and professionals in a variety of discipline utilizing a wealth of informational resources, many of which are not limited by geographical time/space boundaries. Educators who use language to mediate problem solving through Berenfield's *Infosphere* have the ability to not only supply information through technological means but also the potential to impact the culture-- the values, ideologies and social context of the populations they serve.

Building the Team

The cohort system is more than a gathering of individuals. To be most effective we believe a community has to emerge from the process, one in which the group members can rely on each other for support, but one also where the individual makes a commitment to group maintenance.

As part of an instructional web site design process in the "Designing Instructional Materials for the Web" course, the cohort members were responsible for engineering the "look and feel" and the structural organization of a word processing site. Over a period of two three-hour brainstorming sessions, each of the students were responsible for managing the sessions, providing the ideas, identifying problems, areas of expertise, areas of needed research and mapping the ideas to an instructional model. Cohort members were rotated through roles and responsibilities to limit the potential for monopoly and their contributions and self imposed assignments were tracked. It became clear early on that the task was too big for one individual and that a cooperative effort was required. Cries of "Help me out here, Guys" and "Who's going to take this on" were the order of the day. Often one person could not complete his or her task without a finished product from someone else. Waiting on someone else was not an opportunity to relax, but an opportunity to pitch in and help. Not everyone picked up all the skills but all the skills were mastered. Not everyone completed their tasks but all the tasks were completed.

Mapping the Journey

We as instructors set the goals and or objectives

In the Spring of 2000, I "instructed" this technology cohort in Advanced Methods of Instruction. Since, the teachers in this cohort had, on average 12 years of experience, each, and because they had been together as a cohort for a semester, I eagerly took this opportunity to open the boundaries of their learning landscape by inviting them to "map their terrain." Together we defined the broad goals for the course juxtaposed against the landscape of their experience and the road of their teaching and learning needs. We identified three questions for the course, which would guide our inquiry:

- How do people learn?
- What are the pedagogical implications for brain research-based learning?
- How do those implications translate into a cyber-learning environment?

Each lesson that I then created was based on those guiding questions had been based on their input. In order that our learning community be able to think metacognitively about those questions, I posted an open threaded message board which would serve as an ongoing forum to express our thinking as we worked through each lesson.

Next, in my instructional decision making process was to choose texts. Because I wanted to model effective "advanced methods of instruction" and I felt this included the way we utilized technology to support our learning, I used a "cutting edge", theoretically, and delivery-system, online text, How People Learn: Brain, Mind, Experience, and School (Bransford, Brown, Cocking, 1999). In addition to this we used many web-based articles and research including but not limited to: Eric Chudler's Neuroscience for Kids (http://faculty.washington.edu/chudler/neurok.html); an overview of music and learning by Don Campbell and Chris Brewer (http://www.zephyrpress.com/, My thinking was that in order to think deeply about what advanced methods of instruction should look and be like, we needed to understand the latest theory that supported learning, and that we would simultaneously review literature on cutting edge technology and together as a class we process this thinking through five mechanisms:

- Reading
- Reflecting and responding in writing online to and with our learning community
- Taking a stance in writing-by-writing and publishing online short position papers.
- Contacting an expert.
- Taking an action.

Together we took these actions to process the text and online readings I assigned. Then each individual within our learning community began to focus on some specific aspect of brain research, pedagogy and cyber implementation. They read, identified focus topics and then began to construct a web-based project that integrated their findings about brain research, pedagogy, and cyber implementation. This project had to be able to be utilized by teachers or school-aged children. The students in our learning community used their experience, interests and curricular needs which were particular to their teaching experience to identify the topic of their inquiry and to guide them as the developed their learning project. Underlying these actions were the three guiding questions that formed the objective of their study as well as the framework of their assessment:

- How do people learn?
- What are the pedagogical implications for brain research-based learning?
- How do those implications translate into a cyber-learning environment?

However they get there is part of their journey, is part of their learning.

Notes from the Diary

The cohort experience was a positive experience, not only in terms of their coming to terms with both theoretical content and practical skills but most especially in terms of their application of those concepts and skills to their classroom and a wider context.

Student Empowerment:

Students took control over their learning environment by not only establishing their goals and objectives, and choosing the focus of their projects but by taking turns guiding, responding, and nurturing their learning community through their roles as weekly on-line facilitators. Students worked in pairs taking the leadership in this online responsibility. They monitored the boards to see who was responding and wrote and encouraged those who had not yet responded to begin to respond or to ascertain if they were having any technological or other problems which would keep them from responding. They at all times were polite and respectful in these areas and indeed many times did uncover areas in which they could support their colleagues. In this respect our learning community became a sustained support system empowering its members to rely on themselves and each other as they charted this territory.

Sense of Worth and Usefulness

Our learning community indeed began to understand the current state of their knowledge and to build on it, improve it, and make decisions in the face of uncertainty (Talbert and McLaughlin, 1993). With their experience, or as Dewey (1916) states, "records of previous cultural accomplishments" and with the "engagement in active processes, a tremendous sense of worth and usefulness developed as a result of engagement in this course

Students were actively processing theory and juxtaposing it against their prior knowledge and current experience. Becky Harmon chose to read in Neuroscience for Kids and article about the full moon's effect on learning. She relates this to current experience:

> Agggghhhh!!! A lunar eclipse with a full moon all at the same time! I don't know about your students, but students at my elementary school were horrific yesterday and today. The hall outside the principal's/assistant principal's offices was lined with students who had been sent due to bad behavior. This afternoon, I had to stop an almost knock down drag out fight between two second graders while waiting for their day care bus. I've never had problems with them in the past. So when I saw this article, I just had to read what it said on the topic. Boy was I disappointed with their opinion. Read on to find out why.
>
> The article examined the results of studies done on the influence of the full moon on behavior. Most of the reported findings indicate that there is no direct correlation between the full moon and behavior. Only a few studies reported a positive relationship. The article went on to state that the results of the studies were very inconsistent as "some studies show that a particular behavior will occur more often during the full moon and other studies show no relationship between behavior and the full moon." The article stated that the inconsistent findings were, in part, due to inconsistent test situations. Some included behavior only on the day prior to a full moon, while others included behavior on days prior and following a full moon.
>
> I was so interested in the topic I read two related articles. One, "Human Aggression and the Lunar Synodic Cycle", used computer technology to study five aggressive behaviors as reported by emergency rooms in Dade County, Florida. The results indicated a "statistically significant clustering of cases around the full moon." The other article, "Lunar Cycles and Violent Behavior", studies the behavior of hospitalized psychiatric patients during a full moon. The results of this study indicated that there was "no significant relationship." Even the related articles were hard pressed to agree with one another.
>
> Regardless, my own experience in the teaching profession has led me to believe you ought to be prepared to deal with behaviors on or around full moons.

This student used her choice of reading, reading and processing to help resolve learning and teaching question she had. Her choice of topic and quantity of material to read did not limit her, but rather guided her toward meaningful instructional decision-making. Another student, Dennis Huff, wrote this response and took the following actions after reading

> I was very excited about some of the resources I found on Dr. Chudler's web site! I was so impressed that while I was looking it over I contacted my nephews here in Texas and my second cousins up in Maine and recommended that they take a look at this web site! I've also informed my brother who teaches at Eisenhower in Aldine ISD and my coworkers down at Conroe H.S. Although this is primarily a "science" web site, the applications across the curriculum are tremendous and limited only by a teacher's imagination (and I feel I have a very fertile imagination!) I have downloaded the "Web Page Evaluation" form, the" Brain Metaphor" and the "Brain vs. Computer" pages for use in my Introduction to Computers lesson. This way I can make analogies between the brain and a computer to help the students in activating their schema so they can better assimilate my lesson. I'm so happy!

Engagement with a larger learning community

Since part of our weekly assignment was to contact an expert, many of our students used e-mail to do this thus engaging in a dialogue with experts from the larger learning community. Dr. Eric Chudler was kind enough and responsive to answer several e-mails from our students. The following is an example of one of his responses:

> **Brenda:** Certainly helmets will protect the brain whenever there is an impact to the skull. However, Phineas Gage was subjected to an iron rod that pierced his brain...a different type of trauma than those students will ever experience (I hope!). However, here are some other ways to motivate students to wear helmets and to promote good "brain health":

Engagement with this and other expert gave our students a sense of taking part in larger, meaningful discussions from a learning community actively engaged in and disseminating research on learning. Our students felt their voices, questions, concerns, and responses became part of this ongoing body of evolving knowledge.

Modeling what we believe about teaching and learning.

We strongly felt, and my students came to feel that there are not set answers and strategies that make methods and instructions "advanced" but rather there in an understanding that learner-centered environments include teachers who are aware that learners construct their own meanings, beginning with the beliefs, understandings, and cultural practices they bring to the classroom. If teaching is conceived as constructing a bridge between the subject matter and the student, learner-centered teachers keep a constant eye on both ends of the bridge. The teachers attempt to get a sense of what students know and can do as well as their interests and passions--what each student knows, cares about, is able to do, and wants to do. Accomplished teachers "give learners reason," by respecting and understanding learners' prior experiences and understandings, assuming that these can serve as a foundation on which to build bridges to new understandings (Duckworth, 1987).

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Designing Professional Development Schools at the Secondary Level: An Integrated Model

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Background

This paper addresses the critical shortage area of secondary special education by focusing on the development of the first secondary special education Professional Development School (PDS) model for Towson University. Specifically, this proposed PDS model will be used as a recruitment tool for the newly approved Bachelor of Science in secondary special education major at Towson University which was granted in July 1999. The creation of a PDS model in secondary special education will enhance the newly approved major in Secondary Special Education and further the *Redesign of Teacher Education in Maryland* by offering a year long internship in special education. The proposal is aligned with the Maryland State Department of Education (MSDE) recommendation that teacher candidates have a year long internship in specially designed professional development schools. Moreover, this model will include collaboration with the occupational therapy registered (OTR) program --- the only OTR program in Maryland. This proposed model will be the first of its kind within Maryland and possibly the country.

Towson University is well qualified to carry out such a project based on its recognition by the Association of Teacher Education (ATE) as the 1998 Distinguished Program in Teacher Education. This project would complement Towson's already acknowledged award winning status as an outstanding teacher education institution. Yet most importantly the creation and implementation of a secondary special education PDS model would fulfill a critical shortage need by preparing secondary special educators; this need is indicated in the Maryland Teacher Staffing Report for 1999-2001 which identifies the special education area of generic certification grades 6 -adult as a critical shortage area for FY 1999 and FY 2000 (see attachment C). Equally as important, this proposal addresses the chronic shortage of OTRs in Maryland's public schools. In conclusion, the PDS described in the proposal directly supports the *Redesign of Teacher Education*. It will provide school based professional training, give teacher candidates a chance to work with children from diverse backgrounds in diverse settings, and link teacher education redesign to school improvement efforts. Quite simply, it is win-win situation for all concerned.

Goals and Outcomes of the Project

- To develop and implement a secondary special education PDS model that provides coordinated, continuing professional development for all members of the school community which is targeted to the specific needs identified by each school
- To develop the internship in secondary special education to be part of the Bachelor of Science degree
- To provide a school-based setting for a collaborative internship experience for OTRs and secondary special education interns

Plan

Building upon the existing secondary education PDS model, we will adapt this PDS model to meet the needs of secondary special education majors. A unique feature of the proposed PDS model is the inclusion of OTR and secondary special education interns. This collaboration is congruent with best practice in the OT literature, but as yet has not been done. The internship experience builds upon knowledge, reflection, performance, and analysis, the four key learning domains of the Essential Dimensions of Teaching. Specifically , the secondary special education PDS experience will focus on classroom management & discipline, inclusion, collaboration, multicultural perspectives, reflection & program portfolio, and planning for teaching. Performance based indicators for student outcomes will be developed. This proposal will enhance preservice and inservice teacher development by providing a clinical laboratory experience or preservice teachers aligned with the recommendations of the Redesign of Teacher Education.

Project Timeline

In the fall, faculty in special education will shadow secondary education faculty at Wilde Lake High School and Harper's Choice Middle School in Howard County (This has been underway since September 1, 1999). During this period, we will observe and collect data and become familiar with the secondary PDS model. Simultaneously, we will modify the secondary PDS model for special educators, thus designing the special education internship. A course proposal for the internship will be written during January and undergo the curriculum review process during the spring semester 2000. The internship could begin as early as the fall 2000.
In the spring semester, special education and occupational therapy faculty will shadow secondary education faculty at Perry Hall Middle School and Owings Mills High School. The observational period will allow us to establish contacts within the schools in Baltimore and Howard County and elicit letters of support for the expansion of the PDS model at the schools to include special education. It should be noted that all of the above schools have ethnically diverse student populations. Baltimore County Public Schools is the fourth largest school system in Maryland serving over 105, 000 students in 161 schools; it was also declared in the Maryland Teaching Staff Report 1999-2001 as one of the jurisdictions which will experience a shortage of certified special education teachers, as was Howard County. Specific goals, milestones, outcomes and their expected dates of completion follow.

Evaluation Plan

The project, as a planning and developmental activity, will require formative evaluation of the process of model development as well as summative evaluation of its outcomes. Time logs, field notes, agendas of meetings, and notes of meetings will be collect by the project evaluator in order to monitor the process. Progress of the process will be monitored by the completion of the milestones. The primary goal of the project will be the development of the collaborative special education and OT internship. Status reports will be provided to the project team in the fall of 1999 and the spring of 2000. A final report in June will be issued in June 2000. Evaluation will include the performance outcome indicators completed by students in the internship and student evaluations of the internship experience. Interview data will be collected from students recruited into the secondary special education major. A survey of student and their supervising teachers' perceptions regarding the effectiveness of the internship in preparing them for student teaching will be conducted upon implementation.

An independent evaluator will monitor the progress. He will provide formative data to the project team during the fall and spring semesters. Evaluation instruments will be developed to accompany activities conducted in the schools. Consumer groups participating in the activities (Parents, students teachers, TU interns, students and staff will be queried as to whether activities have accomplished their stated objectives and have met consumer needs. Baseline observations will be used within professional development experiences to determine acquisition of content. Formative data will be used to report and modify the model. Qualitative data will include observations, interviews with PDS Site Coordinators, field notes, debriefing notes after meetings, notes from work sessions and curriculum development work sessions.

Impact

As part of its continuing efforts to help all students reach Maryland State content and student performance standards,Towson University continues to develop and disseminate innovative school-based professional development models and support school improvement and career-long professional development for all members of the school community. The PDS model emphasis the Essential Dimension of Teaching specifically dimensions 6, 9, and 10 "to organize and manage a classroom using approaches supported by student learning needs, research, best practice and expert opinion, to collaborate with the broad educational community including parents, businesses and social service agencies and to engage in careful analysis, problem solving, and reflection in all aspects of teaching."

In addition, many of the interns will engage in service learning projects which may involve tutoring students for Maryland Functional Testing, SAT & PSAT Preparation, Maryland Core Learning Goals, etc. Another of the benefits of this program will be using the portfolio assessment process for student interns as they are trained to master the Essential Dimensions of Teaching. All participants will be involved in a developmental process for assessing professional preparation practice, and progress.This proposal specifically proposes to implement the Redesign of Teacher Education which calls for reform in teacher education, Maryland's Core Learning goals. Towson University continues to develop and disseminate innovative school-based professional development models.

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VisionQuest©:
Teacher Development Model for Scaffolding Technology Integration

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Abstract: The professional development model proposed here builds on and extends the use of VisionQuest©, a CD-ROM teacher development tool designed to help teachers envision and achieve technology integration. The VisionQuest© model is based on the assumption that teachers are more likely to embrace pedagogical and classroom change if these changes address real issues they face in practice. Teachers are challenged to reflect on their current knowledge and classroom practices, relative to technology integration, and then, after observing exemplary models included on VisionQuest©, develop and pilot their own solutions to relevant classroom issues. By engaging teachers in reflective activities that nurture and sustain their professional development, VisionQuest© facilitates the growth of teachers' visions for teaching and learning with technology.

Introduction

Despite the fact that technologies have achieved substantial presence in schools (Education Development Center, EDC, 1996), teachers all over the country continue to grapple with both practical and philosophical problems posed by the integration process (Hadley & Sheingold, 1993). Currently, K-12 teachers are experiencing mounting pressures, both from within and outside the educational system, to demonstrate that the huge investments being made in technology are not being wasted. Yet, according to the National Center for Education Statistics (NCES, 1997), "relatively few teachers (20%) report feeling well prepared to integrate educational technology into classroom instruction" (p. 8). Although most teachers report that professional development activities are available to them and that they frequently participate in them (NCES, 2000), teachers continue to face significant barriers as they begin integrating technology within their classrooms.

Traditionally, technology courses for in-service teachers have focused on increasing teachers' technical skills and competencies for using specific software applications. Yet clearly, an increase in teachers' technical skills is insufficient to guarantee the effective use of technology in the classroom. Through previous research efforts (Ertmer, 1999; Ertmer, Addison, Lane, Ross, & Woods, 1999; Ertmer & Hruskocy, 1999; Hruskocy, Cennamo, Ertmer, & Johnson, 2000) we have identified a number of challenges that teachers face as they begin to integrate technology within their curricula. Besides a host of technical and logistical questions (e.g., How does this software package work? Where and when should we use computers?), more subtle issues, related to teachers' pedagogical visions and beliefs, as well as their perceived confidence for using technology, are also known to impede meaningful classroom use.

The VisionQuest© professional development model emphasizes building on teachers' current beliefs and practices. By starting with teachers' prevailing classroom needs, and acknowledging their current levels of self-efficacy, VisionQuest scaffolds teachers' development by meeting teachers where they are. In addition, this model emphasizes the role that teachers' beliefs play in the adoption and change process and specifically outlines how those beliefs might be addressed through teacher development efforts. While traditional staff development models have been aimed at eliminating first-order barriers (barriers that are external to teachers and include skills training and equipment needs), the VisionQuest© model focuses primarily on challenges presented by second-order barriers (barriers that are intrinsic to teachers and that challenge fundamental beliefs about current practice).

Teacher Beliefs

In summarizing research on teachers' beliefs, Pajares (1992) noted that "there is a strong relationship between teachers' educational beliefs and their planning, instructional decisions, and classroom practices" (p. 326). In particular, teachers' beliefs about their *ability to use computers* in instruction may be key, given the role self-efficacy is proposed to play in determining behavior. In a recent study by McKinney, Sexton, and Meyerson (1999), participants with lower efficacy beliefs expressed concerns typical of those in an early stage of change (self-concerns) while those with higher self-efficacy had concerns that were more characteristic of later stages of change (impact-concerns).

Self-efficacy refers to personal beliefs about one's capability to learn or perform actions at designated levels (Bandura, 1997). According to Bandura, self-efficacy is based, not solely on the level of skill possessed by an individual, but on judgments about what can be done with current skills. As such, self-efficacy is thought to *mediate* the relationship between skill and action. Simply put, without skill, performance isn't possible; yet without self-efficacy, performance may not be attempted. According to Bandura, "beliefs of personal efficacy constitute the key factor of human agency" (p. 3). Thus, teachers who have high levels of efficacy for teaching with technology are more likely to participate more eagerly, expend more effort, and persist longer on technology-related tasks than teachers who have low levels of efficacy.

So what does this mean to designers and others who are responsible for teacher development? How can we design professional development experiences that address teachers' second-order barriers, or more specifically, that build teachers' efficacy for using computers in instruction?

Given the long-term nature of the integration/adoption process, we recommend that staff developers/instructional designers meet implementation needs in a responsive fashion--that is, through "iterative interventions" (Frame, 1991) that meet and challenge individual teachers at their current levels of use. As teachers face changing needs, the strategies designed to meet them must also change. In addition, training strategies should be varied to meet the needs of teachers at different levels of technology use. Different strategies are likely to be more or less effective for teachers with different levels of confidence and skill (Snoeyink, 2000). For example, it is important not to discourage those who have low levels of confidence by surrounding them with others who are much more experienced and confident. By designing staff development programs that start with the real concerns that teachers have, and helping them experience success in solving their own problems, we have a better chance of making headway in the technology integration process.

The VisionQuest© Professional Development Model

VisionQuest© is designed to address teachers' second-order barriers, specifically their visions for, beliefs about, and confidence for teaching and learning with technology. This model (adapted from

NCREL, 1997) builds on, and extends, the use of the VisionQuest© CD-ROM teacher development tool, designed to help teachers envision and achieve technology integration.

VisionQuest© features the classroom practices and technology integration visions of six teachers and is designed to support users' reflections on both the underlying beliefs and classroom strategies that enable exemplary technology use in ordinary settings. Teachers, featured on the CD-ROM, share their ideas for classroom technology use and demonstrate how technology supports their fundamental beliefs about teaching and learning.

The VisionQuest© professional development model, which serves as the underlying framework for the CD-ROM, facilitates the growth of teachers' visions for teaching and learning with technology by engaging them in reflective and collaborative activities that nurture and sustain their professional development. The six-step model (Fig.1) facilitates reflection on, and the transformation of, classroom practice. Teachers are challenged to reflect on their current knowledge and classroom practices, relative to technology integration, and then, after observing exemplary models included on VisionQuest©, develop and pilot personal solutions to relevant classroom issues. Through a collaborative and reflective process, teachers gradually develop their own understandings about how to integrate technology in ways that address relevant curricular and pedagogical issues within their classrooms. Each step in the model is described below.

Figure 1: VisionQuest© Professional Development: Scaffolding Technology Integration

Reflect on Current Knowledge

In the first step of the model, teachers are encouraged to reveal the goals they want to accomplish in their classrooms, the barriers that hinder their work, and the instructional and/or administrative concerns they have, related to specific aspects of classroom practice (e.g., classroom organization, assessment practices). Teachers also are asked to reveal their beliefs about teaching as well as the incentives that motivate them to teach. At these early stages of technology adoption and use, the focus is not on specific technology skills or needs. Teachers are encouraged to consider their needs as both teachers and learners prior to considering their needs as technology users. Teachers and trainers work collaboratively to develop an individual teacher profile, followed by the development of an individual teaching/technology plan (ITP) in the next step. Thus, an individual teacher profile might include information about teachers' 1) classroom practices, 2) classroom context, 3) perceived issues and barriers, 4) beliefs about teaching, 5) motivation for teaching, as well as 6) preferred ways of learning and teaching. By beginning with teachers' perceived needs, we remove the focus from the innovation and place it instead on teaching practices and the important issues teachers face.

Observe Models and Cases

One of the most effective ways to help teachers move forward on their technology integration journeys is through the use of peer and exemplary models (Gilmore, 1995; Pintrich & Schunk, 1996) which are believed to lead to increased confidence and competence. During this step, pre- and in-service teachers observe teachers who use technology in their teaching. Web sites, videos, text materials, and the VisionQuest© CD-ROM are used to examine both the pedagogical beliefs and classroom practices of exemplary technology-using teachers. The CD-ROM is organized around the metaphor of a journey and is divided into three sections: Roadmap, Path, and Destination. Within these three sections key themes are addressed: Guiding Vision, Getting Started, Incentives and Barriers, Teacher and Student Roles, Classroom Organization, Curricular Emphases, Assessment Checkpoints, and Sample Student Products and Assessment Tools.

Reflect on Practice

During this step, teachers and staff developers co-develop an individual teaching/technology plan by considering various means for meeting specific needs identified in the teacher profile. That is, after reviewing the issues teachers face, staff developers help translate these important questions into technology-based learning opportunities. For example, if a teacher indicates that she would like to revise her assessment practices, staff developers might help her consider any of the following technology solutions: creating a grade book, determining weighted scores using a spreadsheet, or developing a rubric based on Internet samples. Depending on the type of support teachers request or require, different types of support should be offered (one-on-one consulting, just-in-time training, formal classroom training, peer collaboration and observation, etc.). Some strategies will work more readily and be more appealing than others, depending, at least to some extent, on the barriers teachers describe. Different barriers (e.g., lack of confidence vs. lack of support) typically suggest the use of different strategies. For example, if teachers mention not yet feeling comfortable with technology, they probably are not ready to begin using technology in the classroom. Instead, they need to increase their personal comfort through increased individual and personal use. By acknowledging and helping teachers work through specific first- and second-order barriers, we help them identify strategies that work for them and simultaneously build confidence in their ability to address future barriers.

Initiate Changes

As teachers test their ideas in their classrooms, they experience first-hand what works and what doesn't. As Maddin (1997) emphasized, "the real learning begins back in the classroom" (p. 56). Information obtained through direct experience is one of the most powerful means to shape future practice. Because teacher self-efficacy is a fluid construct, it changes with new experiences. While early success can raise efficacy, early failures may lower it. For this reason, it is probably important that reluctant teachers experience as much success as possible during their first attempts to use technology within the classroom. Additionally, teachers should set realistic goals for themselves since they will measure their success by how closely they meet the goals they have set (Pintrich & Schunk, 1996). It is not critical that reluctant teachers implement a highly sophisticated lesson with lots of bells and whistles. What's most important is that they are successful. Risk and surprise need to be eliminated, or at least greatly controlled.

Reflect on Changes

Kagan (1992) explained that changes in teachers' beliefs are rarely the result of reading and applying research findings. Teachers base most of their ideas on their own and others' experiences. In order to promote professional growth, Kagan recommended that teachers' awareness of their own beliefs be raised, followed by experiences that challenge those beliefs and promote integration of new ideas into current belief systems. Such reflection initiates the revision process. After implementing new ideas or tools in the classroom, the teacher takes time, with or without others, to reflect on the teaching/learning processes and outcomes achieved. Teachers consider how the teaching and learning that occurred compared to what was expected. As teachers realize that their "ability to successfully utilize technology has increased, they are motivated to attempt to learn more about technology, its uses, and benefits" (George & Camarata, 1996, p. 51). However, as with most teaching experiences, there are usually many opportunities for improvement. Teachers should be encouraged to focus their reflections primarily on what the students did or did not do in response to the lesson. Based on this information, teachers can consider what changes need to be made to facilitate the types of student performances or levels of thinking desired.

Modify and Extend Understanding

In this final step, teachers are encouraged to discuss their instructional changes with others and consider the overall usefulness and effectiveness of the changes they have initiated. Based on conversations with others, teachers are encouraged to outline their next steps for development. This may include implementing a revised version of the lesson, adding one more idea to the lesson, or reading relevant literature to examine what others have done. Revisions made after each iteration are not likely to be substantial; however, continual refinements, over time, can add up to noticeable differences. As teachers continue to converse with others about how they addressed a relevant issue in their classrooms, as well as the results they obtained, they initiate, in effect, new cycles of development.

Educational Implications

According to Fisher, Dwyer, and Yocam (1996), "The major challenge to supporting school learning with technology lies not with technology but with the professional development of educators" (p. 7). The success of our technology integration efforts will depend, ultimately, on the focus and effectiveness of our staff development efforts.

Traditional approaches to teacher development have typically employed a one-size-fits-all mentality. *Responsive professional development,* as represented by the VisionQuest© model, meets teachers where they are, yet moves them continually forward by engaging them in activities that explicate both their own and their students' *evolving* understandings. Recognizing that even "expert" teachers continue to evolve (and that expertise is emulated in a variety of ways), early professional development activities impel teachers to reveal, test, and refine current beliefs about classroom practice. As teachers engage in iterative classroom tryouts and collaboratively reflect on changes in students' thinking, they become more sophisticated at recognizing and assessing their own understandings and abilities. Through this ongoing examination of practice, teachers begin to construct deep understandings of how to translate reform-based pedagogy into practice. As initial questions (e.g., What makes a "good" activity?) lead to additional questions (e.g., How can technology support this activity? How do I assess students' work?), the VisionQuest© model has the potential to engender simultaneous changes in instruction, assessment, and teacher and program development.

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A Case Study of a Project to Promote the Integration of Technology in the Classroom at the Elementary Level

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"Abstract": This article examines a professional development project to promote the integration of technology into the classroom with teachers at the University of Puerto Rico Elementary School (UPRES). The purpose of this study is to learn how UPRES teachers learn about technology and on how to integrate this technology into their classroom. This report focuses on the first semester of the special project. In the study a qualitative approach was used for the collection and interpretation of data. The major source of data was the opinion of participants gathered through questionnaires, evaluation forms, and interviews. New practices to integrate technology into the classroom were evidenced and analyzed through participants' lesson plans. The study describes the stages of teacher learning computer technology, their learning needs and how teachers are integrating technology.

The University of Puerto Rico Elementary School (UPRES) is working on a technology plan to promote the integration of technology into the teaching and learning process. One of the components of the Technology Plan is the Professional Development Program (PDP) for the teachers. This component is considered to be the most important one because it could determine the effective integration of the technology in the classroom. Roblyer (2000) and other authors state that properly trained teachers make the difference between the success or failure of an integration effort. The UPRES started a special project to train the teachers in computers and to promote the integration of technology as a learning tool in the teaching and learning process in the classroom. The special project started in August, 2000 and will be completed in May, 2001. The project consists of workshops sessions, the design and implementation of lessons, and the publication and dissemination of the lessons implemented. The purpose of studying the first semester of the Project is to learn how UPRES teachers learn about computers and integrate them in their classroom. The study documents outcomes of the project and to understand more about the adult learning process. The study also revealed knowledge on the process of integrating technology in schools. The findings of this study are expected to be relevant for others schools involved in the similar initiatives.

The study consists of collecting data about the process and outcomes of the technology special project implementation during a four month period. The data was collected before, during and after the teachers participated in the Technology Professional Development Program of the technology special project in the UPRES. A qualitative approach for collecting and interpreting data was followed. The major source of data was the opinion of participants gathered through questionnaires, evaluation forms and interviews. New practices of participants as they integrate technology into the classroom evidenced with the lesson plans were also analyzed. The participants in the study are twelve elementary school teachers and two student teachers. To collect the data, the researcher used various instruments at different phases of the study. For the very beginning, the researcher used an adaptation of the instrument *The Stages in Learning New Technology* (SLNT) developed by Russell (1995). This instrument describes the stages through which teachers learning computers at the starting point of the project. A need's assessment survey was developed to understand the concerns of each teacher and to guide the design of the training sessions. For each workshop, evaluation forms were designed and interviews were carried out as the major sources for identifying the fundamental characteristics of an effective technology learning process and how participants are changing their perspectives on the integration process. The evaluation form measures four criteria: Utility of the software, user-friendly characteristics, effectiveness of the workshop and participants interest to use the software in the teaching-learning process. Also, lesson plans generated by teachers were analyzed to describe how teachers transfer learning to their teaching practice.

Findings: The results of SLNT instrument revealed that 35% of participants are at the basic stage, 24% are at a middle stage, and 41% are at an advanced stage. The need assessment shows that 100% of the teachers in basic level want to learn to use the computer. This information was used to decide to start with two basic sessions for the teachers who are in the basic level. Forty five percent (45%) of the middle and advanced stage teachers need to learn how to use only one computer in the classroom (at the UPRES there is one computer per classroom), and 64% of the teachers need ideas and programs to integrate computers in the classroom. For the first phase of the study, the researcher analyzed data of three workshops offered: Basic computer skills, Inspiration (graphics organizer) and "Erase una vez" (story maker). The participants (100%) who completed the evaluation form agree that the software and the workshops fulfilled the four evaluation criteria. The evaluation form includes questions about their ideas on integrating the software and how they are changing their perspective towards the integration of technology. Figure 3 shows the variety of ideas they expressed. It was interesting to find that all teachers identified different ideas of how to integrate the software.

Figure 3. Ideas of how to integrate the program or software.

Inspiration	"Erase una vez"
-To construct concept mapping (2/5) -To make brainstorming (2/5) -To organize ideas (2/5) -To create diagrams -To present connections between matters -To guide literature analysis -To make outlines -"Story mapping"	-To promote the literature creativity of the students, story making (2/4) -To motivate the students to write (3/4) -Reinforce basic skills in the reading and writing process

The twelve participants of the special project demonstrated they are using the technology for personal productivity. Samples of the kind of work they are doing are: writing/sending letters to parents, creating materials for the students, organizing and planning lessons, obtaining reference material, organizing information and preparing presentations.

Of the twelve teachers, only four teachers evidenced the integration of technology during the first semester of the project through nine lesson plans, which are classified as follows: Promoting writing skills (4); Finding information ; To learn vocabulary; To analyze and organize ideas and; To represent concepts with drawings and diagrams. The four teachers integrating the technology at this phase have between 12 and 15 years of teaching experience. Three of them are at the advanced level.

Discussions: The observations and data collected during the first semester of implementation helped to identify patterns that can be useful to enhance the project and the school technology plan. The next paragraph explains the found patterns. First, those who demonstrate interest in the technology project were at different stages in learning computer technology and have different learning needs. Having determined the stage in learning technology in which they are, and their learning needs, facilitates decision-making to respond to the different developmental stages of the teachers. There are seven (7/12= 58%) enthusiastic teachers that demonstrate motivations to learn more and apply what they have learned about technology. They are consistent in their attendance to workshops. There are five of the teachers (5/12= 42%) who participate in an inconsistent manner and do not demonstrate initiative to integrate the technology in the teaching-learning process. Few teachers aren't interested or had others priority. Second, the data of the evaluation form allows to conclude the following about the workshops: 1) The software selected for the workshops are teacher friendly (Inspiration and "Erase una vez"), 2) The software can be applied in the classroom, 3) The structure of workshops was very effective in teaching participants how to use the software; and 4) Teachers discovered different creative ways for using the software.

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Teaching Electronic Information Research Skills to Teachers

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Abstract: The University of South Africa offers a distance teaching module in electronic information research skills to teachers doing a master's degree. The module is highly practical and caters for different levels of computer skills. It involves the completion of a literature search, the design of a personal database, and the compilation of a bibliography. The study material includes a study guide, a tutorial letter with portfolio activities, CAI tutorials, and a web-site. Students attend a week-long workshop, or master the practical skills on their own. Portfolio assessment enables them to monitor their mastery of the practical skills and to reflect on their weaknesses and progress. Considerable success has been achieved, even with students who are computer illiterate. However, if students do not obtain access to computers and the internet they do not retain the information research skills, and also forfeit the lifelong skills benefits.

Introduction

In South Africa, as in many other countries, there is a growing interest in electronic information, access to the internet and information literacy. The ability to find, evaluate, analyse and use information is strongly associated with progress, prosperity and gaining a competitive edge. Bruce (1995, p.158) for example proclaims: "Effective research, learning, communication, decision-making and problem-solving, require individuals to be able to locate, manage, evaluate and use appropriate information from a wide range of formal and informal sources". The need for tertiary students to be introduced to research information skills can be summarised in Sayed's words (1998, p. x): "Information literacy is thus a "key skill" similar to other foundation skills such as mathematics, statistics, language and communication. The electronic world-brain of the twenty-first century will make information discrimination and handling skills more and more valuable."

Librarians have developed information handling and retrieval skills over many decades, but for many people information skills can open up a new world — especially if they have never even touched a computer before. It is therefore time for librarians to share their skills with people from other disciplines, such as teachers. The condition, however, is that information research skills should be linked to the students' curriculum content (Barry 1997; Oberman, Lindauer & Wilson 1998) and their immediate information needs and topics of interest. Since 1998 the Department of Information Science in collaboration with the Library Services at the University of South Africa (Unisa) has been offering a postgraduate module in Research Information Skills. The module is currently offered to students doing master's degrees in Chemistry Education and Environmental Education. The students are thus all teachers or lecturers — who are in excellent positions to share their newly gained knowledge and skills. Since the content of the module is generic, it can easily be offered to different target groups by simply changing the topics covered in the practical exercises and adjusting the level of assessment. It is thus potentially possible for teachers to share their knowledge with their pupils and colleagues without putting in considerable effort.

Unisa is a distance teaching university. Most of our students are therefore employed adults. They have fulltime jobs, families to take care of and community responsibilities. Furthermore they come from all over the country, from neighbouring countries, and even from Mauritius, the USA and Switzerland. At Unisa we follow a distance teaching model which relies mostly on printed tutorial matter, with no (or very little) compulsory class attendance. For the module in Research Information Skills we do, however, offer an optional one week workshop. Students who are not in a position to attend the workshop are expected to master the skills in their own time by using a variety of resources which are available from the module's web-site. Access to computers and the internet is then a prerequisite. The rationale behind the module is dealt within detail by Fourie and Ten Krooden (1999).

Purpose and Structure of the Module

The module aims at enabling students to do their own literature searches for the dissertation of limited scope which they complete as part of their studies, and to evaluate and organise the search results to support their research. Apart from clearly formulating a research topic and resulting information need(s), the students are expected to select suitable sources for finding information (eg bibliographies, printed indexes, databases, the library catalogue or an internet resource), formulate a search strategy, use various systems to find information (eg the library catalogue, the *ERIC* database or an internet search engine), evaluate the information sources, add relevant sources to a personal database and compile a bibliography as a starting point for their research project. The overall aim of the module is therefore for each student to develop the necessary skills for effective retrieval, evaluation, organization and use of information for research.

The expected outcomes for the module include understanding: the link between research and literature searching; the information industry and information infrastructure; computerized databases; the structure and nature of databases in order to apply this knowledge to information retrieval; how to formulate and adapt search strategies in order to retrieve the most relevant search results; the creation and maintenance of a personal database; what the internet is and how to find information through the different internet resources; and the importance of publishing.

It is therefore an extremely practical module, aimed at teaching a lifelong skill to enable students to keep up in a highly technological and information literate society. Since critical reflection and progressive improvement is a critical component of effective and efficient electronic information searching (also called online searching), the emphasis is strongly on practice, critical reflection, and the ability to spot problem areas and to suggest solutions to overcome these.

Content

Although students are introduced to the total information infrastructure, including printed resources, the emphasis is on the use of electronic information resources such as the library catalogue available via the internet, databases via the internet or on CD-ROM (eg *ERIC*), and other internet resources. The content is set out in a study guide. All students receive a printed copy of the study guide but can, however, also download an electronic version from the internet. The topics covered in the study guide include research and information, information sources, computerized information retrieval, database structures, search strategies, organization and maintenance of information in a personal database, internet navigation, and the use and publishing of information.

Student Population

The module has been designed to cater for the needs of Unisa students. Some of the teachers doing the module are highly computer literate; others have never touched a computer before. Some work in highly technological environments, while others come from rural areas or disadvantaged communities — often without electricity or telephone lines. In the end, however, they are all expected to use electronic information resources to search for literature to complete their dissertations. Additional arrangements therefore have to be made to cater for the needs of computer illiterate students, as well as for those who are highly computer literate and may be held back by an average workshop class. (More about this in a following section.)

It is important to bear in mind that the students are adults, and although they may be ignorant about information research skills, they are experienced teachers and often leaders in their communities. We found, for example, that the students in Environmental Education especially are very active in their communities. They initiate projects for environmental protection or informing the community on environmental hazards. They publish poems, organise prayer groups and offer social comment in their local newspapers. It is therefore essential to value their input as adults, to acknowledge their expectations of the module, and to have empathy with the difficulties they experience in a learning situation that demands computer skills. Some of them admit to being so nervous of using a computer for the first time that they actually shake! In addition to the normal burden (or challenge) of learning a new skill (information searching), they have to use a new tool (a computer) — and save face in the presence of their lecturers and fellow students. (In a separate section I shall deal with how we approach this challenge.) At this stage it is sufficient to acknowledge the truth in Malcom Knowles' (1990) theory of adult learners and andragogics. Most of the teachers take their studies very seriously. They set high expectations for their mastery of the skills involved. Some admit that it is *their* responsibility to put in the extra effort to gain computer skills; they are not satisfied with just following our guidelines in a workshop, but want to complete the information searches all on their own. Some are even prepared to voluntarily repeat the module to ensure that they meet with the standards they have set for themselves.

In general the students are prepared to make huge sacrifices to gain research information skills. They consider it as an important life skill, and are prepared to incur travel and accommodation expenses to attend the workshop, and to travel to the computer laboratories in the regional centres. In 1999 two Namibian students travelled over 2 500 kilometres to attend the workshop! It is of course then our duty to ensure that we offer the best possible learning opportunities.

Teaching Methods and Learning Events

The module is based on a study guide which includes the learning material, self-assessment activities and references to the portfolio activities. Students also receive a tutorial letter with the portfolio activities that need to be completed for assessment. This also contains the guidelines for compiling portfolios and the checklist with assessment criteria. It is important for students to have the latter before embarking on their portfolios.

Two computer assisted (CAI) tutorials are prescribed. They can be purchased from Unisa Press at very reasonable prices (between $4 and $7). One of the CAI tutorials covers the formulation of search strategies (including the selection of search terms, the combination of search terms, searching on word stems, and searching in selected fields only). It also includes numerous examples and questions for self assessment. The other tutorial covers the structure of databases, such as the fields that are included, how to use the fields to search for information, and how to use the information obtained from database records to design a personal database, or compile a bibliography. Students can work through these tutorials in their own time and at their own pace. This is, however, considered essential preparation for the workshop. Students who do not have access to computers therefore have to attend a training session prior to the workshop, or make use of the computer laboratories at the Unisa regional centres.

A module web-site offers links to additional resources and online training material (eg on how to search the library catalogue and how to use the internet). The web-site links to electronic versions of the study material that can be downloaded. It also offers links to supportive material such as selected search engines, information on discussion groups, relevant electronic journals, databases that are freely available, guidelines on evaluating and citing internet resources and the library catalogue.

The learning events also include a week long practical workshop during which students get to use a variety of electronic information resources, and to design their own databases. Since the course is offered through distance teaching, it is not compulsory for students to attend the workshop. If they do not attend the workshop, however, they are expected to use the module's web-site to learn more about the electronic resources that are covered during the workshop. Training manuals and access to the information resources are available from the web-site of the Unisa Library. As part of the workshop an additional session is offered for students who have not previously worked with computers. During the workshop students are taught how to search the library catalogue, a selection of databases such as *ERIC*, and how to use internet search engines and directories. They are also taught how to design their own personal databases. We use either a word processing program such as WordPerfect or MS Word to design the personal databases, or we use a commercial database programme, DB/TextWorks. We have permission to provide students with demonstration disks of DB/TextWorks. They can then use these to create a database that can store up to fifty records. Each student's database should be different, and based on the information they will require to write their dissertation.

Finally, students are also advised to view videos on online searching. These can be ordered from the Unisa Library.

Computer Skills

As mentioned earlier, we have students who are highly computer literate (especially the Chemistry students). A large number of students doing Environmental Education have, however, never touched a computer before. It therefore takes considerable effort and a special atmosphere to get them up to standard so that they can keep up with the rest of the group during the workshop.

Training sessions in computer literacy are arranged prior to the workshop. Students are given the opportunity to work through a CAI tutorial on computer literacy. The emphasis is on the mastery of keyboard skills. We feel that for the immediate purpose of the workshop this is sufficient. During the workshop they are then introduced to navigating the internet, and specific database programs — although they may work very slowly, they at least know where to find the appropriate keys. Students cope fairly well if given sufficient time. We can unfortunately not spend more than two days (eg the Friday and Saturday prior to the workshop) on this angle. Although we found that these students can manage, their slow typing speed frustrates the students who are highly computer literate. The fact that they are already anxious and very aware that they are holding up the group, also impedes their progress.

The ideal situation would be to assess students' computer skills and knowledge of information resources before they attend the workshop. They could then be organised in two groups so that the students with no prior computer skills can progress at a slower, less stressful pace. With sufficient practice and attention they could then master the required skills. We are thinking of developing an assessment instrument to allow students to test their own computer skills to ensure that they meet with our requirements for the workshop. We could also include advice on aspects that they still need to master (eg using the navigation buttons of a typical internet browser or menu driven database). The advantage of such a tutorial would be that it can be made available on the internet, and that students could assess their computer skills in their own time and without embarrassment. They could then work on their skills until they meet our entry requirements.

For a number of computer illiterate students, the workshop provided the impetus to make an effort to gain access to a computer or to purchase one. Since they have the opportunity to reinforce their skills, the module in Research Information Skills really opened a whole new world for them. Although students who do not have access to computers at their places of employment can pass the module based on what they learn at the workshop, they would soon forget the skills they mastered.

A separate workshop for computer literate students would be shorter and at a faster pace and include more advanced activities, such as designing a personal web-site.

Portfolio Assessment

Portfolios were selected as the assessment method since they are highly suitable for Information Research Skills and the reflective and critical thinking skills required by information searching and the design of databases. The reflective nature of search skills is also stressed by Barry (1997) and Fidel (1994). The students have to submit two assignments based on portfolio activities. The assignments are assessed according to a checklist with criteria, and guidelines are provided for improvement of the answers to the activities. For the first assignment we include a personalized letter, because we found that students make many mistakes since they are not familiar with electronic information retrieval. If we were to use the checklist at this stage, it would be too discouraging for them to be confronted with an average or below average rating.

The whole idea behind portfolio assessment is to allow students to make mistakes, to guide them in correcting their mistakes, and to encourage them to reflect on their own shortcomings and come up with suggestions for improvement.The assessment criteria therefore cover the students' learning experiences, the course outcomes, the presentation of the portfolio, the final product (which is the information search, internet search and personal database), and the completion of the self assessment activities. The examination portfolio is basically the improved versions of the two assignments and the final product. To ensure high standards, it is also examined by an external examiner.

Students' experiences

We have gathered data on students' experiences with portfolio assessment and their experiences of the module and workshop through focus group interviews, personal observations and the comments in their portfolios. We have established that the learning content and the portfolio activities must be formulated very clearly and completely unambiguously. Since the field is new to most of the students, they can easily be side-tracked, and they can also become very frustrated if they have to waste time on poorly formulated activities. The reason for including the activities must be explicitly spelled out so that students can link it to the end products they have to complete. (It should be remembered that the teachers are not librarians, and therefore the purpose and value of the activities will not always be obvious to them.) Students must also receive brief but very clear and explicit guidelines on how to compile their portfolios. It does not take much to get the teachers totally involved in portfolios *per se*, instead of focusing on search skills. A number of students mentioned that they learned a lot from portfolios that they can apply to their own teaching situations.

Portfolios are a new method of assessment to our students. It requires a complete change of mind-set and a very supportive and understanding atmosphere to convince them that they are allowed to make mistakes, that they will have the opportunity to correct their mistakes and that they may criticize the lecturer and course content (of course with the necessary substantiation). One student said: "The portfolio experience taught me that I can immediately give the answers, because I can always come back and improve or correct my answers".

Students need to learn that they can trust the lecturer to keep the promises of portfolio assessment. The need for such trust is clear from the following remark by a student: "Although I felt very uncertain in the beginning, I had enough trust in the lecturer to realize that she will not set unrealistic demands. She will not expect us to do something that is impossible". Portfolio assessment also requires a change of mind-set on the part of the lecturer, who needs to learn that the students have higher expectations and that they require more time and attention. Lecturers especially need to learn how to deal with criticism — which is actually invited by portfolio assessment. Fourie and Van Niekerk (1999) and Van Niekerk offer more detail on portfolio assessment (1998).

What Students Gained

The approach we follow in teaching Research Information Skills helps students to realise how they learn — it is not just about the end product: "I was concerned only about the end product, without considering the fact that the actual doing of something can also be a learning experience. We are too set on the end product, which can often cause our work to become very boring." Students also feel that they can apply the skills they have learned outside the immediate situation. They view Research Information Skills as a lifelong skill to share with their pupils, colleagues, and even family members. "I have really enjoyed this course and found that I can apply and share so much of the information and skills that I acquired. I think students need to have a paradigm shift to cope with this course especially with regard to reflective practice." Students felt that they can share their experiences with their fellow students and the lecturer: "The kind of learning that takes place in Research Information Skills, caters for sharing of the processing of constructing ideas instead of simply laboring individually. So everyone, both learners and lecturers, are viewed as resources." Another student proclaimed: "I have also developed as a person and understand that in life nothing is impossible. If you keep on practising and ask for help, you are bound to succeed".

Recommendations

Even though the module is presented through distance learning, students seem to manage well. They are also willing to attend the workshop. A web-site with more support, student interaction and interactive tutorial matter would, however, be of additional benefit. A lack of computer skills impedes students' progress, and since they are adults they may experience even more anxiety due to the need to save face. An electronic assessment instrument available through the web would support them in ensuring that their computer skills meet with our expectations. If not, they could put in more practice through the use of the CAI tutorials before attending the workshop. It should be explained to students that we can support them in mastering the basic information research skills even if they have no prior knowledge of computers. If, however, they cannot gain access to computers and the internet to reinforce their skills, the module would have little more effect than making them aware of the power and use of electronic information resources.

Students should also be provided with more direction on the variety of resources they can consult. This could be done by mapping the information infrastructure for the particular discipline (eg Environmental Education or Chemistry Education), or even building this into a subject portal. The emphasis would be on searching for information from these resources and evaluating the results. Furthermore, it would also be necessary to consider differentiated learning events for students who are highly computer literate, and who have access to the internet. This could include the development of personal web-sites to organise the results of their literature searches, and to offer links to their discussion groups and journals they need to consult regularly. It could also include links to the numerous current awareness services offered via the internet, and to an electronic portfolio. In future the main emphasis should be on developing opportunities for students who come from different communities: to offer sufficient support as well as sufficient challenges.

Once students from disadvantaged communities have mastered the basic skills, they should have the opportunity to work on more challenging tasks. Since students have to complete the module in one year, this is currently not possible.

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Mentoring Overcomes Barriers to Technology Integration

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Abstract: This paper examines the use of Instructional Technology graduate students as mentors to K-6 elementary teachers in a rural community in the use of technology and the integration of technology into the daily curriculum. Mentors were able to support the elementary teachers in overcoming the barriers to technology use by modeling a *vision* for integration, just in *time* learning, *access* to equipment, *professional development* opportunities and methods for *assessing* student work involving technology use.

Introduction

As educational institutions acquire more sophisticated hardware and software, an overwhelming need arises for teachers to obtain the necessary skills to implement these tools into the classroom curriculum. To make effective use of these tools, teachers must redesign lessons around technology resources, solve logistical problems of how to teach a class of students with a small number of computers, and transform the role of teacher in the technologically transformed classroom (Maddux, 1997).

While teachers indicate they see value in students using computers, some are not able to make the connection to how the computer fits into the daily classroom. Common barriers to the use of technology by teachers include the vision, access, time, assessment, and professional development (Office of Technology Assessment, 1995). This study describes a mentoring relationship among elementary teachers in a rural school district and graduate students in Instructional Technology at a midwestern university in a College of Education.

The Study

This study investigates one-on-one mentoring as a means of professional development strategy for in-service teachers in using technology in the teaching and learning process. An elementary school in Southeastern Ohio was selected as the study site. The study included eight in-service teachers and eight doctoral students of instructional technology participating for 20 weeks. The participating teachers (*called mentees in this process*) were teachers in grades K-6. The mentors were 2nd or 3rd year instructional technology graduate students.

Data was gathered from multiple sources using multiple measures including a need assessment survey for teacher mentees, the journals of both teacher mentees and graduate student mentors, and focus group interviews with teacher mentees. Additional data was gathered via a review of print and digital documents and field notes taken by the researchers. The researchers conducted data analysis concurrent with data collection, in a cycle beginning with data collection, continuing through reflection and analysis and then looping back through more data collection. The number of data sources helped to triangulate the data during the research process.

Findings

With respect to the barriers to technology use, the mentoring process provided a model for overcoming these barriers. The barriers are provided below with examples of how mentoring transformed the barriers:

Vision. Mentors modeled integration of the technology in the teacher's classroom providing opportunities for the teacher to observe how technology can be used and managed in their own setting. Often it is not that teachers do not want to use technology but that they lack the ability to "see" and "manage" how technology can be used in the teaching and learning processes of the everyday classroom. Mentee elementary teachers indicated that the process of modeling the use of technology in real settings afforded them the opportunity to "see how it works" and that it is indeed manageable.

Access. Teachers needed help with technical support. Mentors provided the teachers with the needed support by showing teachers how to repair machines, load software, navigate printing problems, and locate needed hardware. This provided teachers with more access to the technology in their classrooms.

Time. Teacher schedules are very difficult to manage. The mentoring allowed the mentor and teacher mentee "just in time" learning. Teachers met in their own classroom, used their own equipment at the time the teacher wanted to work. In a focus group discussion, teachers echoed these sentiments stating," I want to learn how to use the technology myself, but having the mentor gave me the opportunity to learn it in my time frame and with the students."

Assessment. Teachers had an opportunity to use the experiences of the mentor to determine ways of designing and evaluating projects. Mentors provided lesson design opportunities to teachers in instances in which the evaluation of technology skills were desired by mentee teachers.

Professional Development. Mentoring allowed the teacher to examine ways of using computers within the curriculum and learning new skills. Mentoring helped the teacher to develop strategies for overcoming the barriers of vision, time, access, and assessment.

In general, the mentors often presented the elementary teacher with models for integration. It was observed that teachers used these models to redesign their lesson to incorporate the use technology into the lesson that was being taught at the time. Teachers did not create artificial lessons but instead followed their planned lesson and incorporated the technology to enhance the learning process. Some of the examples included following: 1) *Native Americans* – used a lesson plan on Native Americans to help students create a HyperStudio stack about Native Americans and to quiz the students on knowledge gained in the Native American Unit; 2) *Solar Systems* and *US Constitution* – worked with students to create two HyperStudio stacks, one on the solar system and the other on the US constitution; 3) *Class Homepage* using Communicator – with the help of the mentor worked with her students to create a class homepage; and 4) *Student Album* – worked with students to create a HyperStudio stack with pages for each student.

Conclusions

The mentoring involving the university instructional technology graduates and elementary teachers overcame many of the time and access barriers to technology integration in elementary classrooms. The mentoring provided vision to the teacher for designing lessons around technology-rich resources, the solving of technical support problems and motivation to use technology in the teaching and learning process. Comments from the teachers at the end of the 20-week period support the continuation of such projects in this elementary school and with others in the area.

The mentoring strategy is a promising means for obtaining professional development in schools for technology integration. Mentorship provides models of computer use to the classroom teacher and help in lesson plan design. This university/K-6 mentoring partnership supported the professional development of the graduate student mentor as well. Finally, in rural school districts that often have a difficult time obtaining substitute teachers, it provides a cost effective means for obtaining technical support and professional development in the use of technology.

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Integration or Inoculation?: Selected Large-Scale Professional Development Studies

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Abstract: This paper highlights a selection of research studies on multi-district professional development projects producing a clear call for more long-term involvement on the part of administrators and the intellectual, social and philosophical benefits for educators when using a mentoring system.

Teacher training theorists such as Darling-Hammond (1997) stress that traditional models of in-service training are simply not effective. While the literature abounds with research centered on the delivery of professional development (PD) in technology at the building or the district level, the same is not true regarding larger-scale (e.g. multi-district or statewide) research where descriptive models and suggested projects are most prevalent. The paucity of research in this area begs for aggregation. This preliminary literature review highlights a selection of studies that present a clear message to anyone undertaking a multi-district plan.

"Teacher expertise is the most important factor in determining student achievement," writes Linda Darling-Hammond (Darling-Hammond & Ball 97). Yet requisite technology training is not as widespread as such a strong statement would imply. A 1999 survey reported that only 29% of teachers had more than five hours of PD in technology curriculum integration in the past year (Fatemi 99). For various reasons, PD has not been the answer that educators seek; a national survey of teachers' technology use found that 93 % of teachers cited independent learning as their preferred mode of preparation, compared to professional development activities (88 %) and colleagues (87 %) (National Center for Education Statistics 00). Nor can we expect the passing of time (and subsequent retirement of untrained teachers) to be the panacea. Fatemi notes that "teachers who have been in the classroom five years or fewer are no more likely to use digital content than those who have been teaching for more than 20 years" (1999).

Griffin (91) defines professional development as "a serious and systematic effort to engage a group of professional educators who work together, a staff, in activities designed specifically to increase the power and authority of their shared work" (p. 244). For many individuals, the effective curricular integration of computers is predicated on a fundamental change in philosophy and pedagogy that must often unfold in the absence of a formalized, supportive culture. Further complicating the PD mix is the multitude of concurrent reforms in education. One pilot project and four peer-to-peer initiatives illustrate the search to extend skill and understanding of computer use for K-12 educators into technological praxis.

In search of formative data, a Louisiana collaborative targeted PD and curriculum integration as part of a statewide pilot study. The teachers involved in the university-run course and the 3-day workshop certainly offered a multitude of suggestions for future iterations but it was noted that they were impressively committed to the project and overwhelmingly enthusiastic about its potential (Whelan et.al. 97). The researchers found two vital characteristics of successful schools. First, these sites exhibited strong management teams with "a commitment to collaboration among partners within the district, including those at the local university and... others outside of education. Additionally the evaluation team found a high degree of commitment to ongoing staff development in successful projects and schools" (p. 418).

A highly successful mentoring project resulted from the collaboration between a technical college and educators from 14 school districts in New Jersey. For three years, monthly meetings and two-week summer institutes resulted in over 150 contact hours between mentors and mentees. By contrasting the most and least successful schools, Holahan and colleagues (00) found the most striking difference was "the extent to which administrators supported the mentor teachers in learning to use computers, developing curricular materials, and providing peer mentoring, as well as the extent to which administrators supported the mentee teachers" (p. 344). A similar program, Regional Educational Technology Assistance in New Mexico began in 1995 and continues today, thus proving the initiative's sustainability. Researchers Norton, & Gonzales (98) noted the acute need to involve administrators, and that the most useful aspect for participants was "the ability to network and share with colleagues... and the opportunity to learn and think about new curriculum and instructional ideas" (p. 44).

Mentor type programs are not only a phenomenon of the United States. As the capacity for large-scale PD emanating from Australia's Department of Education began to diminish, Williams (97) noted that professional organizations stepped in to support teachers as they assumed responsibility for their continuing education. She chronicles one such distance education project delivered that purposefully included face-to-face interactions. The planners negotiated two release days per month for each teacher to attend conferences, study or visit a mentor's classroom. A significant discovery in this research was that immersion within the technology also provided the conduit to professional relations with other educators. This reflective collegiality was a critical factor in deeper philosophical engagement for these educators. Although modest in scale (15 teachers per year) New Zealand sponsored two cycles of Facilitator Training. They handpicked teachers nationally for diversity in teaching experience, fluency with technology and geography (Compton & Jones 98). These teacher facilitators interacted with 355 others. Among the key findings was the value on embedded opportunities to network with colleagues.

These large-scale PD initiatives embody two consistent and key factors. The long-term commitment of administrators in the PD process leads to sustainable integration of technology. A "pre-packaged" inoculation fix solely mandated from above did not appear in this research; the capacity for customization based on the schools' needs, curriculum, existing expertise of teachers is absolutely essential. Furthermore, these successful programs manifested the recognition that learning takes time, practice and meaningful interaction with colleagues.

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Ensuring Technology Leaders in Classrooms and Beyond: Technology Training in a Graduate Teacher Education Program

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Abstract: This paper discusses the integration of the ISTE foundation standards into the Master of Education in Curriculum and Instruction teacher education program and the resulting impact on the teachers' acquisition of technology knowledge and skills, their classroom teaching, their students' learning, and in a broader sense their schools and districts. The program is described with particular attention given to the way in which students acquired and demonstrated technology knowledge and competencies. Successful integration of the ISTE standards into the program is viewed in terms of the quality and variety of products / assessment pieces using technology that have been generated by the students. Finally, the paper examines the resulting benefits to school districts that employ the teachers participating in this master of education program.

Introduction

The integration of technology into both undergraduate and graduate teacher education programs is one of the most critical issues in higher education today (Rogers 2000). Technology has become central to life in the second millennium. Research has shown that teaching and learning is enhanced by effective use of technology (Kauchak & Eggen 1998). Technology allows a more flexible, interactive, and creative educational setting that brings an immediacy to learning. It enables students to explore areas of interest and deal with real-life problems and issues (Knapp & Glenn 1996). Thus, technology knowledge and skills empowers teachers as well as students.

Undergraduate teacher education programs have embraced the demand for inclusion of technology into curriculum and instruction, with the result that students now are graduating from programs with the knowledge and skills delineated in the technology foundation standards developed by the International Society for Technology in Education (ISTE) (1997), and adopted by the National Council for Accreditation of Teacher Education (NCATE). However, many educators in classrooms gained their initial degree before technology became a component in undergraduate teacher education programs. Many have not participated in district staff development or college courses related to technology in education (McCannon & Crews 2000). Therefore, it is imperative that graduate programs provide opportunities for teachers to develop and enhance their technology competencies.

Background

The Master of Education (M.Ed.) in Curriculum and Instruction was designed to develop dynamic, reflective teachers with the abilities to develop, implement, analyze, evaluate and improve their own practices. The six program goals state that graduates of the program should be able:

#1 to identify, analyze, and explain (a) successful curricular models and instructional strategies and explore the basis for their success, and (b) curricular and instructional problems impeding the improvement of learning and teaching in classrooms and schools, and propose sound solutions.

#2 to monitor, evaluate, and suggest means to improve instructional practice, including the evaluation of educational outcomes and programs.

#3 to assume responsibilities for the development, implementation, evaluation, and revision of curricula or programs of study in particular disciplines and/or for particular populations.

#4 to locate, evaluate, interpret, and apply appropriate research and scholarship to the study and solution of practical educational problems in curriculum and instruction.

#5 to plan and conduct action research, using sound theory and appropriate research designs, to investigate educational questions related to the improvement of curriculum and instruction.

#6 to demonstrate professional leadership skills and continued professional growth in curriculum and instruction.

To achieve these goals the student must demonstrate the knowledge and effective use of skills including (a) communicating with students, colleagues, parents and the public; (b) making decisions; (c) solving problems; (d) collecting, analyzing, and interpreting data; *(e) selecting and using appropriate technology*; (f) working to resolve diversity issues; and (g) striving to continually improve instruction. The program uses the ISTE foundation standards to guide the development of the students' technology understandings and competencies. There are eighteen standards grouped into the three categories of basic computer/technology operations and concepts; personal and professional use of technology; and application of technology in instruction.

Master of Education students enroll in a two year core of 24 semester credit hours with a cohort of between 30 and 40 students. Now in the sixth year of operation, the site-based M.Ed. program has been made available to 18 different cohorts at 12 off-campus sites with 399 graduates as of the end of the Spring semester, 2000. Another 182 students are currently in the program with 90 scheduled to graduate by the end of Summer 2001.

Each site-based program is taught by three facilitators; one from the university, one from the host site and a third person from the field who complements the expertise of the other two facilitators. A major focus of the program is reflection on practice and action research.

Students work on projects for curriculum and instruction improvement at the classroom, school and district levels. Projects may be conducted by an individual, by small groups from the cohort, or by a collaborative group comprised of one or more M.Ed. Curriculum and Instruction student along with parents and colleagues such as teachers, principals, curriculum advisors, and school curriculum and instruction teams. Student-generated project topics focus on appropriate and effective ways to address needs, concerns and questions about personal classroom practice, school organizational patterns and school-community issues.

This paper examines ways in which the ISTE foundation standards have been integrated into the Master of Education in Curriculum and Instruction graduate teacher education program; and the impact of technology integration on the teachers' acquisition of technology knowledge and skills, their classroom teaching, their students' learning, and in a broader sense their schools and districts.

Technology integration into the Master of Education program

The Master of Education in Curriculum and Instruction program's constructivist approach to learning (Fisher, Dwyer & Yocam 1996; Kauchak & Eggen 1998) creates a number of opportunities in which students can acquire technology knowledge and competencies; and then requires their use to successfully complete assignments. In the first semester of the program, the instructional coordinator from the host district provides technology training as the students require it for the completion of research and presentations. During regular class time, students select labs to learn to use e-mail, the Internet, Microsoft Word, Excel, Access, PowerPoint, and HyperStudio. These lab training opportunities continue throughout the two year core program in addition to individual tutoring sessions as needed.

Students also go on campus to receive training in conducting electronic searches. The training is facilitated by library personnel at the main library at Wichita State University. The following week after this training, another class period is spent in the library where students research a self-selected topic for a literature review project. It is expected that they will put into practice the skills gained in the previous week to use available electronic search resources. Students continue to use these skills throughout their M.Ed. program, to complete electronic searches for other projects. After learning how to use the automated library system and gaining the skills of electronically accessing information, students research curriculum and instruction topics and issues relevant to their classroom practice.

The use of software such as Microsoft Word, Excel, and Access, is integrated into the students' action research projects as well. Students use these software programs to analyze, organize and report the data they have collected. With the software, students are able to make professional quality tables and graphs that are used for poster presentations, in research papers, or in multimedia presentations that they develop to share research findings.

Technology is integrated also into the communication procedures of the program. E-mail is used on a regular basis to communicate general course and program information to all students. An electronic newsletter is produced by the site facilitators approximately three times a semester and sent via e-mail. In between class meetings, students communicate by e-mail with course facilitators concerning course and program requirements; and with other students about projects being completed collaboratively.

Effects of technology integration on student products

Successful integration of the ISTE standards into the program is viewed in terms of the quality and variety of products / assessment pieces using technology that have been generated by the students. These products include poster projects, PowerPoint presentations, web site development, the use of BlackBoard for course communication, statistical analyses, and electronic portfolios.

Technology is viewed by teachers as a viable method to enhance the learning and teaching in their classrooms (Kauchak & Eggen 1998). In this program, teachers' action research projects focus largely on ways to better the education process for the students in their classrooms. Improving curriculum and instruction in any content area and at any grade level, often includes the integration of technology into existing curriculum (Knapp & Glenn 1996). Students conduct action research on technology integration topics such as using computer generated graphic organizers for reviewing and testing with elementary students; creating a Web site for the school district and community; and using the Internet to benefit students' learning. Research is also conducted on the use of technology to enhance home-to-school communication such as in the investigation of the use of BlackBoard to keep in daily contact with parents of high school chemistry students.

Technology has been integrated into student assessment in the program. Students are required to complete 3 projects in each of the four core semesters of the program. The presentation of all of these projects requires the use of various technologies, thus creating the context of performance assessment for every project.

Projects are reported in four different ways. Following the more traditional manner of presenting research, one project per semester is written as a paper. This requires the use of computer software such as Microsoft Word and Endnote to write and format the paper; and Excel and Access to organize data into graphs and tables for insertion into the paper.

A second way in which projects may be reported is through a poster presentation. Students use software to make graphs, tables, titles and labels for their poster. Some students use a digital camera to record events relevant to the project, and then print the photos to display on their poster. A requirement for the poster presentation is that a handout of some type with a summary of the information be available with the poster. This handout often takes the form of a brochure created with software such as Publisher98.

Students also present their projects orally. Many students use technology to create visual aides similar to what might be used in a poster presentation. Additionally, video clips, filmed and edited by the student, have been used to enhance oral presentations.

Finally, at least one multi-media presentation of a project is required during the four semesters of the program core. This requirement is usually completed during the third or fourth semester when students have acquired advanced technology skills. A student's ability to successfully complete a technology presentation depends to a great extent on his / her acquisition of the competencies set out in the ISTE teacher technology standards. To receive a satisfactory rating for the presentation, the student must (a) use two or more types of media in the presentation; (b) use the Internet as a resource and appropriately cite the information; (c) use the technology to complement not distract from the presentation; and (d) demonstrate organizational skills, such as the use of storyboards, in the planning of the presentation.

Benefits to school districts

As teachers have completed the program, a number of general benefits to school districts employing these teachers have become evident. The program has provided the opportunities for teachers to develop exceptional leadership skills in such areas as curriculum development, instructional strategies, educational research, student assessment, strategic planning, team building, facility planning, school improvement models, material selection, and staff development. These skills have resulted largely from the action research projects that the teachers have conducted and presented in the two years of their core course work.

Although expertise in these areas is impressive to employers, the technology-related benefits have been remarkable and gone beyond the districts' initial expectations. Teachers gain the knowledge to make informed decisions in the selection of hardware and software. Technology integration into the curriculum has been by way of various software packages, use of the Internet, and computer clusters. Teachers have set aside their overhead projectors and replaced them with laptops, LCD projectors and PowerPoint or HyperStudio presentations. Smart Boards, scanners, digital cameras, audio and video clips and CDs are used frequently in these teachers' classrooms. The impact of the program partnership between the host site districts and the university has provided technology competent teachers for the district as anticipated. What has been a surprise is the *extent* to which the teachers have integrated technology into their own classrooms and then, confidently led other teachers to do the same.

But the integration of technology has not been confined to classroom practice. Program graduates have demonstrated their abilities to use technology for school level and district level activities such as the presentation of Quality Performance Accreditation (QPA) reports; curriculum development presentations to school boards and communities; and in the production of school informational brochures, videos and PowerPoint presentations for parents.

Additionally, it has allowed the host district to create technology leader positions in each school. Technology leaders are paid a stipend to provide guidance to the building staff on successful integration of technology into the curriculum. They model teaching that uses technology and they conduct in-service training to increase staff technology knowledge and skills. Teachers wanting to serve in the position, complete an application and then demonstrate technology skills through various technology products. The products are often from assignments that have been completed by the teacher as part of the master of education program. The district has noted an increase in the number of teachers applying and qualifying as technology leaders, and attribute this increase to the teachers' participation in the Master of Education, Curriculum and Instruction program.

Conclusions

The successful integration of the ISTE foundation standards into the Master of Education in Curriculum and Instruction teacher education program has made a substantial impact on the teachers' acquisition of technology knowledge and skills. It has encouraged the integration of technology into their classroom practice, enhanced their students' learning, and contributed to greater technology integration in their schools. Benefits to the school districts that employ the teachers participating in this master of education program have also been noted. Districts benefit in that the teachers are more technology competent. Additionally, the program has allowed districts to create technology leaders in the district.

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The West Chester University *Teaching and Learning with Technology* Program: Aligning Graduate Credit Courses with NETS-T Standards

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Abstract: This paper describes the development of a graduate certificate program for teaching and learning with technology. Program development is a complex process that has numerous accrediting, policy-setting, and political bodies to satisfy requiring the integration of convergent ideologies, all focused on the improvement of teaching and learning. Use of the National Educational Technology Standards for Teachers (NETS-T) enhanced our ability to articulate and expand our vision for technology integration in education. Rather than make this program disparate, the attempt to meet these standards and frameworks resulted in a rich and comprehensive program that will have real value for the teachers and students it serves. This presentation will highlight the development and some of the early results of this program as it is implemented at West Chester University in January 2001.

Background

In 1998 the International Society for Technology in Education (ISTE), in cooperation with the US Department of Education, developed and published National K-12 Educational Technology Standards for students. Subsequently, the standards were connected to curriculum and technology (ISTE, 2000). In April 2000 the National Educational Technology Standards for Teachers (NETS–T) were established through an initiative funded by the US Department of Education's Preparing Tomorrow's Teachers to Use Technology (PT^3) program. These NETS–T standards were approved and adopted by National Council for Accreditation of Teacher Education (NCATE), the accrediting body for West Chester University (WCU). They were the guiding principles as we structured and developed a graduate program at our university, created for educators to learn the dynamic relationship among teaching, learning, and technology integration.

It is important to note that our program encourages teaching with technology rather than teaching about technology and is directly linked to classrooms in K-12 schools. Consistent with a Professional Development School initiative, and/or the teacher-scholar model, our graduate program will be offered through alternative delivery mechanisms such as use of the web, 2-way video and on-site classes in participating school sites.

Process

The development and writing process of this graduate program has been shared so that others can benefit from the lessons we learned. We created three graduate courses for our program: a survey course covering the breadth necessary for understanding educational technology integration; an in-depth curriculum and instruction design, and development course; and an application course called seminar and field study. Through focus groups held in Spring 2000 the development of the graduate program was informed by educators from area K-12 school districts, as well as business and community representatives. This process helped us to focus directly on the needs of our clients and the students they serve.

In addition to meeting academic standards of university curriculum committees, this program also is designed to reflect the conceptual framework that drives our teacher preparation program here at WCU. The components of the WCU Conceptual Framework addressed are: **content knowledge, knowledge of learner, knowledge of self, reflection, and professionalism.**

As we learned and digested the NETS Standards we created a matrix that referenced the 6 standards identified by NETS-T that all classroom teachers should be prepared to meet (see Table 1) and listed the objectives we intended our graduate students to meet under each of the categories. We adopted the 21 indicators of the NETS-T performance profile for practicing teachers (see Table 2).

I. Technology Operations and Concepts
II. Planning and Designing Learning Environments and Experiences
III. Teaching, Learning, and the Curriculum
IV. Assessment and Evaluation
V. Productivity and Professional Practice
VI. Social, Ethical, Legal, and Human Issues

Table 1: Six NETS-T standards for all classroom teachers.

The matrix is comprised of 21 performance indicators identified by NETS-T for practicing teachers. Each indicator is associated with the relevant NET-S standard (see Table 1) by Roman Numerals. The specific courses that focus on the performance indicator are listed. The program has used multiple methods of assessing whether the teachers have demonstrated competence in each of the standards. The type of assessment is indicated in the last column of Table 2.

	Course			
Performance Profile: Practicing Teachers	500	501	502	Assessment
1. assess the availability of technology resources at the school site, plan activities that integrate available resources, and develop a method for obtaining the additional necessary software and hardware to support the specific learning needs of students in the classroom. (I, II, IV)				a. Integrated curriculum unit
2. make appropriate choices about technology systems, resources, and services that are aligned with district & state standards. (I, II)		X		a. Evaluation of resource & standards handbooks
3. arrange equitable access to appropriate technology resources that enable students to engage successfully in learning activities across subject/content areas and grade levels. (II, III, VI)	X	X		a. Cross-curricular project b. Integrated curriculum
4. engage in ongoing planning of lesson sequences that effectively integrate technology resources and are consistent with current best practices for integrating the learning of subject matter and student technology standards (as defined by ISTE's National Educational Technology Standards for Students). (II, III)	X	X	X	a. Curriculum unit b. Cross-curricular project c. Tech design and implementation
5. plan and implement technology-based learning activities that promote student engagement in analysis, synthesis, interpretation, and creation of original products. (II, III)	X	X	X	a. Cross-curricular project b. Tech design and implementation
6. plan for, implement, and evaluate the management of student use of technology resources as part of classroom operations and in specialized instructional situations. (I, II, III, IV)			X	a. Tech design and implementation
7. implement a variety of instructional technology strategies and grouping strategies (e.g., whole group, collaborative, individualized, and learner-centered) that include appropriate embedded assessment for meeting the diverse needs of learners. (III, IV)	X	X	X	a. Project development & presentation b. Lesson design and implementation c. On-site visits, observations d. On-line peer evaluation
8. facilitate student access to school and community resources that	X			a. Project development

provide technological and discipline-specific expertise. (III)				
9. teach students methods and strategies to assess the validity and reliability of information gathered through technological means. (II, IV)	X	X	X	a. Software & website reviews b. Internet resource project c. Authentic assessment
10. recognize students' talents in the use of technology and provide them with opportunities to share their expertise with their teachers, peers, and others. (II, III, V)	X			a. Journal reviews and discussions b. Project development
11. guide students in applying self- and peer-assessment tools to critique student-created technology products and the process used to create those products. (IV)	X	X		a. Technology plan b. Project presentations c. Electronic portfolios
12.facilitate students' use of technology that addresses their social needs and cultural identity and promotes their interaction with the global community. (III, VI)			X	a. Lesson design and implementation b. Site visit and evaluation
13. use results from assessment measures (e.g., learner profiles, computer-based testing, electronic portfolios) to improve instructional planning, management, and implementation of learning strategies. (II, IV)	X		X	a. Project development & assessment b. Electronic portfolio
14. use technology tools to collect, analyze, interpret, represent, & communicate data (student performance & other information) for the purpose of instructional planning & school improvement. (IV)		X		a. Resource handbook
15. use technology resources to facilitate communications with parents or guardians of students. (V)			X	a. Professional portfolio b. Lesson design and implementation
16. identify capabilities & limitations of current and emerging technology resources & assess the potential of these systems & services to address personal, lifelong learning, & workplace needs. (I, IV, V)	X	X		a. Software and website reviews b. Research journal reviews & discussions
17. participate in technology-based collaboration as part of continual and comprehensive professional growth to stay abreast of new and emerging technology resources that support enhanced learning for PK-12 students. (V)	X	X	X	a. Resource handbook b. Journal reviews and on-line discussions
18. demonstrate and advocate for legal and ethical behaviors among students, colleagues, and community members regarding the use of technology and information. (V, VI)	X			a. Mid-term exam b. Journal reviews and discussions
19. enforce classroom procedures that guide students' safe and healthy use of technology and that comply with legal and professional responsibilities for students needing assistive technologies. (VI)			X	a. Lesson design and implementation b. On-site evaluation
20. advocate for equal access to technology for all students in their schools, communities, and homes. (VI)	X			a. Mid-term exam b. On-line discussion
21. implement procedures consistent with district and school policies that protect the privacy and security of student data and information. (VI)			X	a. Lesson design & implementation b. On-site visits & evaluation

Table 2: Program matrix with NETS-T performance indicators.

Outcomes

Use of the NETS-T standards has given validity and focus to the development of this program. The program shows the impact of this work with a focus that concentrates on technology use for the improvement of teaching and learning in K-12 schools. The presentation of this paper will include the products that were created through the process. These include a Power Point ™ presentation, *Teaching and Learning with Technology* brochures, and data from our evaluation report.

Conclusion

Working on the development of this program through the use of the NETS-T standards enhanced our ability to articulate and expand our vision for technology integration in education. We are confident that the design of the program meets current needs and expectations for teaching and learning with technology.

This program was created through the integration of convergent ideologies, all focused on the improvement of teaching and learning. Rather than make this program disparate, the attempt to meet these standards and frameworks resulted in a rich and comprehensive program that will have real value for the teachers and students it serves.

This paper presentation will highlight the development and some of the early results of this program as it is implemented at WCU in January 2001.

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Subject-Specific Technology Integration Training: Lessons in Planning, Administering, and Follow-Up

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Abstract: Strickland (1999) reported the results of a Teacher Technology Mentor program in southeastern Idaho, which strongly indicated that the school mentors were not transferring their technology knowledge into classroom practice. Strickland recommended that subject-specific technology integration programs be developed to insure better integration of technology in the classroom. Based upon this recommendation, Idaho State University's FOCUS program was developed, targeting three specific areas: fourth grade, secondary language arts, and junior high earth science. This research focuses on the planning, administering and follow-up of one of the junior high earth science program. The goal of this research was to determine if the subject-specific technology integration training of earth science educators makes a difference in teachers' attitude and use of technology in classroom teaching practices. Data from attitude surveys of earth science educators involved in the FOCUS program suggest that teachers' attitude and use of technology in the classroom increase when in-service technology training is subject-specific.

Introduction

The National Governors' Association (Houghton, 1997), the federal government and various state legislatures (Thurlow, 1999) have recommended that teacher training become a part of technology planning, and that approximately 30 percent or more of technology dollars be spent on teacher training. This is in light of the fact that only five percent of the nation's 2.8 million teachers are integrating technology into their regular teaching practices (Parks and Pisapia, 1994). A recent U.S. Department of Education survey (as cited in Thurlow, 1999) indicates that only 20 percent of teachers reported feeling "very well prepared" to integrate technology into classroom instruction. Thurlow suggests that professional development programs be provided for in-service teachers to give them the confidence and skills they need to incorporate technology into their curriculum. Further, Thurlow indicates that many in-service programs focus on providing teachers with basic skills in using hardware and software, but do not provide them with "curriculum-based applications and strategies for integrating them in their instructional activities."

In 1999, Strickland reported the results of a Teacher Technology Mentor program in southeastern Idaho, which strongly indicated that the school mentors were not transferring their technology knowledge into classroom practice. Many of these contemporary teachers, even after being trained how to operate computer systems and tool software (word processors, spreadsheets and databases), were struggling to incorporate this training into their regular teaching practices. Teachers reported that they did not see how the technology could be applied to their subject matter. Strickland recommended that subject-specific technology integration programs be developed to insure better integration of technology in the classroom. Based upon this recommendation, Idaho State University's FOCUS program was developed, targeting three specific areas: fourth grade, secondary language arts, and junior high earth science.

Methodology

This research focuses on the planning, administering and follow-up of one of the eight month long subject specific technology integration programs—the junior high earth science FOCUS program.

In the planning process, it was determined that the junior high earth science program be broken into four subsections: (1) geology, (2) space science, (3) weather science, and (4) oceanography. Teachers would be trained on how to incorporate the Internet, content software, and tool software into each of these subcategories.

To accomplish this task, a notebook and website of materials would be developed with lesson-plan ideas, a list of earth science Internet websites, and a list of recommended software germane to each subsection.

Teacher training consisted of a one-day technology workshop. The one-day workshop supplied teachers with hands-on examples of technology integration in the earth science curriculum; provided educators with a notebook of resources for integrating technology in the earth science curriculum; prepared educators for follow-up classroom visits, WebCT bulletin board postings, technology integration lesson plan writing, and evaluating software and Internet websites.

The FOCUS teacher-training program differs from traditional mentor-type programs described by Thurlow (1999) in that it contains a rigid schedule of teacher follow-up and assessment. Teachers were required to post weekly bulletin board journals on WebCT about how they were incorporating technology into their curriculum; to develop four lesson plan activities that incorporate technology into the curriculum; to evaluate four earth science-related software; to evaluate eight earth science-related Internet websites; and to have classroom visits by a qualified technology instructor.

Findings

Based upon pre- and post-workshop attitude surveys of junior high earth science teachers in southeast Idaho, there was a significant increase in the average attitude scores $t(9)=-2.514$, $p=.033$. Four of the twenty-nine attitude survey questions asked directed question about their use of technology in the classroom. After completing the FOCUS earth science program, the average score of each of these four questions increased. The improvement in Internet resources use was not significant $t(9)=-1.309$, $p=.223$; the improvement of tool software use was not significant $t(9)=-1.152$, $p=.279$; the improvement in commercial software use was not significant $t(9)=-1.714$, $p=.121$. However, the improvement in the use of multimedia presentation software was significant $t(9)=-3.161$, $p=.012$.

Conclusions

When technology integration is subject-specific teachers' attitudes toward technology significantly increases. Teachers are also more likely to incorporate technology into their curriculum, as evidenced by the increase in use of Internet resources, tool software, commercial software and multimedia presentation software. These results seem to confirm Thurlow's (1999) and Strickland's (1999) suggestions that curriculum-based technology training will improve teachers attitudes toward technology integration, and that by improving attitudes toward technology integration teachers will be more likely to use technology in their classroom practices.

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Teachers Discovering and Integrating Technology: An National Online Success Story

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Abstract: The purpose of this study was to determine if teachers could be taught to use and much more importantly integrate technology into their specific classroom curriculum in a national online graduate level educational technology course for K-12 teachers, Teachers Discovering Computers. Both quantitative and qualitative data were collected and analyzed. The pretest and posttest surveys included fourteen, five-point Likert items, and the posttest contained five open-ended questions. Analyst of quantitative data revealed there was a significant difference between the mean scores of the pretest and posttest scores, $p = .000$. Qualitative data revealed that 100% of the student had a positive experience in the class and learned how to use and integrate technology into their specific classroom curriculum. The combination of both the statistical and qualitative analysis lead the researcher to conclude that the impact of the course on the student's perception and integration of technology into the curriculum was dramatic.

Introduction

As communities adjust to the dynamics of the 21st century, the continued prosperity of their citizens will depend upon economic stability and growth. Economic stability and growth will depend upon the ability of a region's K-12 education system to graduate students with the required basic and technical skills needed for employment and life long learning (Draves, 2000).

Without a K-12 educational system producing skilled workers for a region's businesses and industries, continued economic growth becomes stagnated. When schools graduate poor quality students, who lack appropriate skill levels, the entire infrastructure of a region may begin to break down. The most serious problem hindering continued economic development and expansion in many, if not most American communities, is the lack of an educated entry-level worker. As we enter this new century, many American business are experiencing a severe shortage of skilled employees in virtually every area from software engineers, retail and service professionals, to semi-skilled blue collar workers (Perry-Johnson and Millsaps, 1999).

For many reasons, graduating K-12 students has become a very complex social issue. Administrators of K-12 school districts are finding it more and more difficult to: (1) keep students in school and (2) graduate students who possess the required basic skills and technology competency necessary to enter the workforce or to be able to succeed at institutions of higher education. Those students who drop out of school or graduate lacking the proper skills are doomed to join the ever expanding lost generation of American youth. These students simple do not posses the required basic and technology skills necessary to succeed (Trotter, 1999).

Many political leaders are stressing that building a world-class work force must be a national priority for continued economic prosperity in the new global economy. Improving America's capacity to educate and train workers is critical to the future of this county. In the words of former President Bush, "Think about every problem, every challenge we face. The solution to each starts with education." (Blount and Kearn,1991, p. 1). As we have moved into the 21st century, there has been a movement or a paradigm shift to change the way we teach teachers how to both use and integrate technology (Robyler, 2000). Our society has undergone dramatic changes in this century, yet the way our teachers teach and our students learn has not. In fact, we need to redesign our educational systems to be more hands-on and learner centered (Shelly, Cashman, Gunter, and Gunter, 2000).

Teachers in the nation's schools are charged with teaching students who will spend all of their lives in technology driven society. The computer, as a leading technological device, was expected to be a solution in the restructuring of school systems. Yet, many of these teachers report little knowledge of or the ability to use and more importantly to integrate technology into the curriculum. The discrepancy that exists between what teachers know and what students must learn about technology represents a complex issue, even though computers have been available in schools throughout the nation for years (Trotter, 1999). Federal and state funding initiatives have stressed that school districts should purchase technology at an accelerated rate and link those technologies to the Internet. However, the placement of technology in schools, has not been the salvation that many had hoped or even predicted.

The lack of technical expertise shown by the teachers extends from those teachers who have just entered the profession to those already in the field. United States Secretary of Education Richard W. Riley noted in a speech, "Teaching and learning that uses technology effectively can lead to greater academic success and make a real difference in the lives of students. Unfortunately, only 20 percent of today's teachers feel very well prepared to use this technology" (Riley, 2000). Many researchers and educators from federal and state agencies, institutions of higher learning, and K-12 schools have been focusing on why technology has not made a difference in the classroom and repeatedly the same conclusion arises – teacher training. Unfortunately, most training initiatives to date have concentrated on how to use technology and not how to integrate technology.

Research has shown that properly integrated technology by qualified and caring teachers can significantly enhance student learning, increase attendance and graduation rates, improve test scores, and motivate students to want to improve themselves (Schwartz, 1999). Unfortunately, the dramatic increase in purchasing of technology has not improved student achievement at many of our nation's public schools. The primary reason is a lack of teacher training.

Many institutions of higher learning are looking to the improvements in training that industry, business, armed services, and other educators are observing. Educators are hoping to receive guidance in this move to educate students, any path, any time, and any place. In other words, teaching students in a different medium through the use of distance education (Andrews and Marshall, 2000). Our instructional strategies are going to have to change and undergo major transformations.

Due to the increasingly diverse population, education is changing toward a more global, technology-rich environment designed to meet these diverse and changing needs of students. The creation of easy to use graphical browsers has dramatically increased the popularity of the Internet and the World Wide Web (WWW). The Internet has shifted from being a communication mode of text-only to a powerful multimedia communication system with applications that have the potential to revolutionizing teaching and training. This technology phenomenon has directly impacted and is transforming the way we teach and the way students learn (Geibert, B. & Harvey, S.H., 2001). These changes have brought the WWW to the forefront of instructional strategies for all educators. The World Wide Web removes all barriers of time, place, and physical limitations and opens more training opportunities for teachers.

The purpose of this study was to determine if K-12 teachers could be taught to use and much more importantly integrate technology into their specific classroom curriculum in a national online graduate course educational technology course for teachers, Teachers Discovering Computers (TDC).

Methodology

Teachers Discover Computers, an online graduate level educational technology course, was tested in a pilot study at Hungerford High School in Orlando, Florida at the request of senior business leaders in central Florida. The pilot study was conducted between August and November 1999 and all of the teachers at Hungerford High School participated in the TDC online graduate course. Due to the success of the pilot study, Teachers Discovering Computers is being offered nationally as an online graduate level course to K-12 teachers.

The sample utilized for this study consisted of three sections of students who completed the online national graduate course in Spring of 2000. These courses are thirteen-week online graduate-level technology courses that consists of thirteen extensive online curriculum modules, including an end of course curriculum integration project that requires computer, information, and integration literacy. Of the 101 student enrolled in the class, 29 were high school teachers, 26 middle school, 32 elementary, 12 were taking for certification/recertification in other areas, one student was a private music teacher, and one students was a business professional.

The following is a description of the populations of the three classes: The first class began on November 16, 1999 and ended on February 23, 2000. Thirty-nine students began the first national TDC course on November

16, 1999 with 38 students completing the course on February 23, 2000 for a 97% course completion. The 38 students were from six states (Florida - 12, Massachusetts - 3, Michigan - 3, New York - 13, Ohio - 5, and Pennsylvania - 2). Initial survey results revealed that only four students possessed more than basic computer skills (e-mail and word processing) and only two had integrated technology into their classroom curriculum.

The second class started on January 11, 2000 and ended on April 11, 2000. Thirty-five students began the second national TDC course on January 11, 2000 with all 35 students completing the course on April 11, 2000 for a 100% course completion. The 35 students were from seven states (Florida – 14, New York – 6, Massachusetts – 4, Ohio – 3, Pennsylvania – 3, Virginia – 3, Michigan – 2).

The third and last class of this study started on February 1, 2000 and ended May 2, 2000. Thirty-one students started the third national TDC course. Two students transferred to the April course due to injuries sustained in a car accident. One student dropped out of the course. Twenty-eight students completed the course for a 97% completion rate. The 28 students were from seven states (Florida – 12, Pennsylvania – 5, Michigan – 4, Ohio – 3, New York – 2, Massachusetts – 1, and Virginia – 1).

Findings

Both quantitative and qualitative data were collected and analyzed. The pretest and posttest surveys included fourteen, five-point Likert items, and the posttest contained five open-ended questions. The five open-ended posttest questions: (1) Please explain how this course has increased or decreased your support for the use of technology in K-12 education. (2) As a result of your experiences in this class, how has your attitude changed toward integrating technology in your instruction? (3) What words and phrases would you use to describe your experiences in this class? (4) What is the most important thing that you learned in this class? (5) Where do you see yourself one year from now as a result of this class?

Quantitative data analysis revealed there was a significant difference between the mean scores of the pretest and posttest scale scores from the November, January, and February TDC courses. There were 70 students who completed both of the pretest and posttest evaluations and a Pair wise T test was used for the analysis. The pretest mean was 33.29 with a standard deviation of 8.01, while the posttest mean was 22.56 with a standard deviation of 5.63. A summary of the is provided in Table 1.

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	**PRESCORE**	33.2857	70	8.0129	.9577
	PSTSCORE	22.0857	70	5.6279	.6727

Table1: Paired Samples Statistics

Pair wise T test results revealed a significance level of .000, thereby indicating a strong treatment effect shown in Table 2. This leads the researcher to conclude that the impact of the course on the student's perception and integration of technology into the curriculum is dramatic.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	**PRESCORE-PSTSCORE**	11.200	9.2605	1.1068	8.9919	13.4081	10.119	69	.000

Table 2: Paired Samples Test

Qualitative data revealed that 100% of the students had a positive experience in the class and had learned how to use and integrate technology into their specific classroom curriculum. The following are a few examples of the teacher's answers to the open-ended questions: One teacher stated, "Before taking this course I wanted to integrate technology in the classroom but did not know where to start or where to look for help. I was basically frustrated." Another teacher felt, "The exposure I have had through this course has opened my eyes to the many possibilities within my classroom." "The Words that I would use to describe my experiences in this class would be DISCOVERY and LEARNING. Discovering the many ways I could enhance student performance in my classroom by integrating technology effectively. And learning the ways in which to integrate the technologies" was stated by another teacher. This teacher stated, "I have been using computers for sixteen years. I never realized the resources for education available prior to taking this course." "When I began the course I felt very uncomfortable about integrating technology. Having completing the class, I have no doubts that I am up to the tasks." "By far the most important thing I learned in this class is that I now have the ability to successfully integrate technology into my instruction. The confidence I've gained has made me eager to use technology." Please note all qualitative data is available for readers to review at http://www.teachereducation.com/tdcres.html.

Conclusions

Research studies have revealed that students who are in a supportive, less stressful environment, and are actively involved in the instructional process tend to be more academically successful. Through this online graduate course, teachers felt they were learning in a very supportive environment. The combination of both the quantitative and qualitative analysis lead the researcher to conclude that the impact of the course on the student's perception and integration of technology into the curriculum was dramatic. This study revealed that teachers could be taught to use and integrate technology in an online environment. Finally, the quantitative and qualitative research revealed that teachers could be taught to use and much more importantly integrate technology into their specific classroom curriculum in a national online graduate level educational technology course.

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South Central Regional Technology in Education Consortium

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Abstract: The Regional Technology in Education Consortia (R*TEC) program was established by the US Department of Education to help states, local educational agencies, teachers, school library and media personnel, administrators, and other education entities successfully integrate technologies into K-12th grade classrooms, library media centers, and other educational settings, including adult literacy centers. To provide such help, the R*TEC establishes and funds several regional consortia that address professional development, technical assistance, and information resource dissemination. The 2000-2005 South Central Regional Technology in Education Consortium (SouthCentral R*TEC) serving Arkansas, Louisiana, New Mexico, Oklahoma, and Texas is now located at the Southwest Educational Development Laboratory in Austin, Texas. Through a program of focused professional development and information services for teachers and administrators, the South Central R*TEC will enable educational systems in its five state region to use technology to foster student success in achieving state content standards, particularly in schools serving high population of disadvantaged students.

Identifying a Need

The SCRTEC finds that its most critical challenge and its best opportunities for effective action is in helping teachers mesh increased concern for accountability on state content standards with increased interest in the use of technologies for teaching and learning. While national reports indicate that although numbers of computers in schools are increasing and the student/computer ratio is falling, students are not using technology as a tool for learning. According to "Technology Counts" data, only 14% of fourth graders and 13% of eighth graders nationally report using technology daily; moreover, 53% of fourth graders and 39% of eighth graders report "never or hardly ever" using computers.

This gap between the presence of technology and its effective application was foremost on the minds of state and local leaders when the SCRTEC spoke with them about how the SCRTEC could be most helpful. Their unanimous plea was not for basic training in the use of technologies – they already had systems in place for meeting those needs. Their major need was for help in integrating technology into effective teaching and learning.

Given the states' unanimous call for help with integrating technology into classroom instruction and improving students' success in achieving state content standards, SCRTEC planning focused on how those needs could be met through specific objectives and work. SCRTEC identified four distinct groups and their needs: (1) Classroom teachers: What do they need to integrate technology into their classroom practice to address standards? (2) District level educational leaders: What do they need to see to support the integration effort? (3) Service units and higher education: What do they need to provide resources, networks, and support? and (4) State level departments of education: What do they need to prepare and create policy and support to improve systems?

From a working list derived from the needs of all levels, the SCRTEC distilled a set of concentrated, cross-cutting needs to form its current objectives: (1) Build capacity of teachers: the need to enhance teachers' knowledge and skills for integrating technology into learner-centered instruction focused on achievement of content standards. This need addresses both preservice preparation and inservice professional development programs and it presumes an intermediate audience of those who provide preparation and training. (2) Build capacity of leaders at the state, district, and campus levels: the need to enhance the knowledge and skills of education administrators in their effort to support the integration of classroom technology focused on achievement of content standards. This need addresses inservice professional development for campus and district leaders and establishment of professional development communities for state and higher education leaders. (3) Promote use of electronic delivery systems: the need to ensure optimal use of technology-based delivery systems to achieve the widest possible impact from training and resources.

Meeting Needs

SCRTEC will accomplish its objectives through activities conducted in accordance with the program's three prescribed strategies: professional development, technical assistance, and information and resource dissemination. These activities will be carried out collaboratively and with tools available to the SCRTEC from its partners and members. (1) The *Active Learning with Technology* professional development portfolio from the Southwest Educational Development Laboratory, (2) The Aurora Project's (Oklahoma) web-based development and delivery system, (3) The Technology Leadership Institute's higher education network (TCET at the University of North Texas) with its Evaluation Compendium and Technology Leadership Web Library, (4) Student Diagnostic Database Tool from Hart Elementary School (Austin, Texas), (5) The Electronic Emissary Project from the University of Texas (Austin), (6) A network of Access Centers from SEDL's Southwest Center for the Improvement of Mathematics and Science Teaching (SCIMAST) in cooperation with the Eisenhower Clearinghouse.

SCRTEC will also develop and promote a Regional Electronic Clearinghouse that will include easy searching of resources linked to content standards, online evaluation tools, regional professional development registry, educator forums, and telecollaborative projects. Concentration will focus on alternative delivery methods including CD-ROM, web-based modules and courses, and videoconferencing and developing partnerships with state departments of education and other technology and content standard initiatives throughout the region. SCRTEC will develop a Master Teachers Network with 25 teachers from each state, a Professional Development Network, and a Higher Education Network.

Materials and Publications

SCRTEC currently has a variety of materials available that are designed to aid teachers in creating constructivist learning environments supported by technology. This portfolio of materials includes:

Connecting Students, Learning and Technology. This booklet is designed to offer teachers practical information on getting started with technology and student-centered practices. The document is available both in print and online from the web site at: www.sedl.org/pubs/catalog/items/tec26.html

Planning into Practice: Implementing and Integrating Instructional Technology. This book was developed in collaboration with the Southeast and Islands Regional Technology in Education Consortium and assists school planning teams in their efforts to implement technology to improve teaching and learning. It helps teams to move from visioning to goals to action.

Constructing Knowledge with Technology: A Review of the Literature. This paper discusses the tenets of constructivist learning theory in light of its role in education and use with technology. Also available from the web site at: www.sedl.org/pubs/catalog/items/tec27.html

The web site – http://www.sedl/tap/resources.html This is an online database of web resources for teachers and professional development providers. There are multiple subject areas with links to web sites that lend themselves to constructivist approaches and technology.

Active Learning with Technology portfolio. These sixteen professional development modules are available for professional development providers and are based on constructivist learning theory and promote active learning through several classroom management models. They have been field tested with both teachers and professional development providers. Each module contains a step-by-step facilitator guide and is downloadable for free in PDF format from this web site: www.sedl/tap/profdev.html Additional modules will be created and added during the tenure of the SCRTEC.

Tap into Learning newsletter. The newsletter offers useful and highly practical information for K-12 educators wishing to use technology to support more constructivist learning approaches. Each newsletter discusses the classroom implications of a particular student-centered approach and offers classroom examples illustrating such an approach in combination with an appropriate type of software application. The newsletter also provides information on using commonly found educational software. It is available in print and online at: www.sedl.org/tap/newsletters

Video Series. This series of six videos is designed to be used as part of professional experiences for educators. They can be used in a variety of ways and suggestions for using these videos are included in the various facilitator guides in the professional development portfolio. Two videos, *Engaged Discoverers: Kids Constructing Knowledge with Technology* and *Classrooms Under Construction: Integrating Student Centered Learning with Technology* can be used for visioning activities with both school administrators and teachers. Four videos contain specific classroom teaching episodes from 1st grades through 9th grades with classroom teachers carrying out a variety of activities using technology.

Consortium Members and Partners

The newly formed South Central RTEC is comprised of the following consortium members: the Southwest Educational Development Laboratory (SEDL), Texas Center for Educational Technology (TCET) at the University of North Texas, and the Aurora Project (Oklahoma). Consortium partners include the Regional Educational Technology Assistance (RETA) program at New Mexico State University; the Electronic Emissary Project' University of Texas Austin, Southwest Center for the Improvement of Mathematics and Science Teaching (SCIMAST); Hart Elementary School, Austin Independent School District; and the Dana Center for Education, University of Texas, Austin.

Strengths of the SCRTEC include its concentration of effort on students and teachers in schools serving high populations of disadvantaged students in rural or isolated areas and its network of 450 professional development providers across its five-state region. Each of the partners and members will aim at achieving the goal of enabling educators and educational systems to fully employ the benefits of technology to foster student success in achieving state content standards.

LUMA: The Next Step in a Partnership to Enhance Technology Integration

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Abstract: Technology enriched learning environments have a positive effect on the achievement of students. It would seem, therefore, that the environments of in-service educators must also be rich in technology and technology integration. After developing a partnership that focuses specifically on technology integration with pre-service and in-service educators, a second partnership developed to work with specific academic departments at the Upper School level integrating technology within an established curriculum. The goal of this partnership, LUMA (Lehigh University/Moravian Academy), was to give teachers in specific academic areas access to materials, plans, ideas, and support for integrating appropriate technologies into their class activities. From experience, the developers of this partnership know what *doesn't* work—the one-day, one-shot, show-and-tell workshop developed by outside consultants and delivered to teachers. Instead, these workshops were designed to be spread out over an academic semester, involve the teachers in the design and development, and provide support for the teachers between workshops.

Introduction

Technology enriched learning environments have a positive effect on the achievement of students (Schacter, 1999). It would seem, therefore, that the environments of in-service educators must also be rich in technology and technology integration. The CEO Forum in its StaR Report (February 1999) built a strong case for enhancing the education of in-service teachers in technology and curriculum integration. In fact, one of the seven goals of the report deal directly in-service teacher education:

> Goal 2: Current teachers and administrators should be proficient in integrating technology into the curriculum.

Yet, according to the report, only 20 percent of teachers feel well prepared to integrate technology into their classroom instruction. Teachers lacking support and encouragement are more likely to give up using technology if something should go awry (Bronack & Hornung, 2000). A National Survey of Teachers' Use of Digital Content highlighted in Education Week (1999) found that 97% of the teachers surveyed used a computer at home. Of those who use computers for instruction, nearly half of those surveyed claimed that the amount of preparation time necessary for curriculum integration was a large problem. In order for standards to be met and teachers to feel prepared, in-service and pre-service educators must make effective use of technology in learning and show evidence that this learning has taken place (Schacter, 1999). However, teachers must see the relevance of technology integration and what they teach to use technology effectively and show evidence of learning.

A Partnership

Aligning and infusing technology into the curriculum should be a top goal for educators (Fatemi, 1999). In the Fall of 1998 a partnership between Lehigh University and Moravian Academy- a preK-12 independent school, was established to help meet standards and prepare teachers. Throughout these past three years, the partnership has focused on technology integration in school curriculum. The partnership paired a pre-service, Lehigh University, undergraduate with an in-service, Moravian Academy, mentor teacher. Their goal was to work together on technology integration while balancing classroom management, school philosophies and time. The partnership has seen great success and will continue in the Spring of 2000.

The Partnership Continues

Evaluations from the partnership, however, brought to fruition the idea of working with specific academic departments at the Upper School level to integrate technology within the established curriculum. The goal of this partnership, LUMA (Lehigh University/Moravian Academy), is to give teachers in specific academic areas access to materials, plans, ideas, and support for integrating appropriate technologies into their class activities. From experience, the developers of this partnership know what *doesn't* work—the one-day, one-shot, show-and-tell workshop developed by outside consultants and delivered to teachers. Instead, these workshops were designed to be spread out over an academic semester, involve the teachers in the design and development, and provide support for the teachers between workshops.

Designing the Partnership

The academic areas of focus for this semester in the LUMA workshops were math and foreign language. A team of three graduate students, from Lehigh University, served as the designers of the workshop materials. The graduate students worked with a designated faculty team member from Moravian Academy in each academic area to gather resources, design materials, and to prepare for each workshop. The faculty member served two functions --to ensure that what is designed by the graduate student fit the needs of the department, and to increase the likelihood that the other department faculty will join in the workshops.

One partnership goal was to spread out the workshop meeting dates over the course of the semester. Therefore, workshops were delivered in September, October and one in December to interested teachers in that academic area. The materials developed for each content area included: development of a course website, gathering of instructive educational websites for each discipline and the introduction and implementation of Webquest. (Webquest is a teaching tool which integrates technology and curriculum directly.) The course website and Webquest materials included identifying and reviewing other websites and software, example activities, assessments, rubrics, and best practice models. The graduate students designed many of these materials and activities, as well as an "instructors guide" for the workshop that can be used by Moravian faculty for future technology integration workshops.

Communication was a key factor in bringing together the many facets this partnership required. At the onset the participants were enrolled in a webcourse designed specifically for the workshop (http://www.blackboard.com/LUMA-educ). Weekly emails updated the Moravian teachers on hot topics and "Tidbits" of information useful to the discussions and practical applications that had been explored during the workshops. This was also the forum for questions and answers. The graduate students shared responsibility in checking the website, answering email questions and adding useful information weekly.

Evaluating the Partnership

Since the inception of the LUMA partnership, the graduate students have been working to structure and implement the fall workshops. Together the graduate students wrote a power-point presentation to outline the workshops for the Moravian Academy faculty team member. The course website created a space for the information collected and used to be kept in one place for all participants to have access to. This also allowed a place for a "journal" to be kept about the progress of the planning and workshop implementation. At the completion of the second workshop, we asked each teacher to provide an evaluation and description of their needs for future planning. This evaluation directed us in planning our final workshop. Our goal was to divide in specific academic areas and work individually with the faculty participants. Perhaps this will be the impetus needed for several of the teachers to use their course workshop as a teaching tool.

Implementing this New Partnership and the Implementation Dip

As with any new program, the implementation dip was prevalent for our Upper School partnership. Lack of time, experience and even interest were some of the factors that hindered the program. Our goal to spread the instruction over the course of several weeks was designed so that the teachers would have an opportunity to work on their own in developing curriculum appropriate work within a course web-site. We felt that beginning our work in September would allow teachers the time to start their school year with fresh ideas. We encountered the opposite to be true. Most of the teachers were overwhelmed with beginning of the year obligations and spent little to no time working on their course website. In addition, the initial time spent introducing the teachers to the course website and design may have overwhelmed our participants from the beginning. Therefore, they may have been reluctant to take future implementation steps.

Lack of experience also hindered some of the educator's growth. While our attempt to match a graduate student with teachers in specific academic departments appeared ideal, the graduate students were not present to the faculty at Moravian on a regular basis. An on-line presence was established but very few of the teachers took advantage of that assistance. Several of the teachers took advantage of the workshop time to develop together their course websites. This group experience appeared to assist each other and "join" their experiences together. While these educators may not have created their own course website, they did create an academic department website to assist them in their teaching. This experience, therefore, may have brought together a new collaboration that was not present prior to the workshops.

Some of those educators who joined the workshop at its inception were unclear of what tools the workshop would provide them. After seeing the varied uses available in a course website, several of the teachers felt that this technology would not be a key tool in their curriculum. Therefore, they chose to not participate further in the workshops. Other factors such as time and experience may have also influenced the several teachers who did not complete the three workshop cycle.

For those teachers who did complete the three workshop cycle, the implementation dip was prevalent. In fact, as far as the researchers can tell, it may take more than one workshop cycle to support and work through the needs of the various educators within each department.

Some Examples of Teacher Needs

At the completion of the second workshop, those teachers present were encouraged to communicate via email what needs they still would like to be met in the course of these workshops. Here are just a few examples of what they shared with the presenters.

"It was great having the time to sit at the computer and play! I never have the chance to do that during the school day. I think this is why I have not had my students do anything with computers as of now. Next week they will have the opportunity to check out that "day of the dead" web site. I would have liked to create my own web site today. Guess I got side tracked. I'm going to try and do that on my own, and if I run into trouble then I will contact one of you guys." Ali, Upper School Spanish.

"I need lots of time for the simplest concepts to sink in because I rarely see the "big picture" right away. But I am making progress. I went in this morning thinking that a personal web page was a year or 2 down the road, but now I think I may be able to handle this in a few months. However, when simple things like sending Claire an e-mail through the Blackboard site don't work, I get discouraged, put the LUMA stuff away, and don't touch it until the next meeting." Mimi, Middle School Spanish

"Since this was my first LUMA workshop, I was mostly "playing" with the Blackboard.com...I am open to researching the use of websites to allow me to post info about my classes and to research useful things for class. I'm not too comfortable with computers- that's something I'm working on... We will have a new textbook next year, which will include lots of software - so next year may be a perfect time for a graduate student to work with me in the classroom. Meanwhile, I'll keep coming to workshops and try to become more comfortable with MACs (I use my PC at home much more often!)" Bonnie, Middle and Upper School French

As we continue to evaluate this partnership, specific areas of further focus will emerge to help us prepare for our next partnership. Questions and concerns that may arise from our evaluation:

- The issue of time and commitment from those involved may emerge.
- Are there other ways and times to incorporate these learning objectives for the teachers?
- What has the teacher gained from participating in this type of workshop?
- What other pieces of technology or curriculum need to be part of the workshop format?

In addition, the teachers will have an opportunity through this evaluation to review the knowledge they have acquired and the direction they wish to pursue for additional learning. Those planning these workshops will also have the opportunity to evaluate the format and direction that the workshops took.

Future Planning

We hope that the evaluation from all those who participated in the workshop process will give light to their increasing knowledge and understanding of working with technology within their curriculum. One reason our focus has been on the specific subject areas is in hope that those teachers will feel supported by their colleagues who are also taking part in the workshop. Should the partnership continue at this level we will continue to focus on curricular areas and work with the remaining academic departments. In addition, the support given by the Lehigh University graduate students directly to the individual teachers will provide the Moravian Academy teachers with the encouragement needed to use their new found skills to enhance their teaching. Therefore, we can address the questions of how this format was useful and added to their teaching experience. All this knowledge will assist us in our future planning.

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Ways to Integrate Technology in Your Classroom

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Abstract: This educational web site creates a framework for understanding technology tools and how they can be used for teaching different subjects in the classroom. The site provides links to general education, subject-specific and community sites. Its distinct features are the integrated language arts thematic units developed by teachers in a Connecticut school system to help their students meet the objectives of the Connecticut Achievement Performance Test (10th grade CAPT) and a template to submit your favorite lesson. The web site is organized into four sections: I. Technology Tools II. WWW Educational Resources III. Lessons Database IV. Reading Strategies.

Description

The goal of this educational web site, ***Ways to Integrate Technology in Your Classroom***, is to provide a comprehensive guide to beginning and advanced web users. In addition to providing an overview of technology tools, the site has pages with links to general education and subject-specific sites, sample thematic units for secondary level language arts and a template to submit your favorite lesson plans for publication on the Lessons Plans page.

Technology Tools: *Publishing Tools, Productivity Tools, Internet Tutorial*

Publishing Tools describes ***Powerpoint***, ***Hyperstudio*** and web publishing software. It gives ideas on how teachers and students can use them to present their work and useful addresses for download and usage. For those looking for a server to host their home page and wishing to build a quick home page, there is a download link to ***Tripod***.

Productivity Tools gives suggestions on how to integrate spreadsheets, word-processing and graphics applications in the classroom. It also provides information on software and sites for downloading graphics.

Internet Tutorial consists of three pages: ***Browser Basics***, ***Search the Web***, ***Users Interact***.

Browser Basics tells how to access a web page, view documents, make bookmarks and act on browser errors.

Search the Web gives search tips and links to useful tools that can go a long way towards getting quick and efficient search results. For example, putting a phrase in quotes "" and using the ***Metacrawler*** search engine (www.go2net.com) can drastically reduce the frustration in any search.

Users Interact has links to ***Hot Mail***, the free e-mail service that lets you log on to any computer with an internet connection to check and send your e-mail. It also introduces search tools for usenet groups, to find out what other people have posted on any topic.

WWW Resources

K-12 Web Sites features recommended comprehensive web sites for teachers, Internet Projects conducted by students, K-12 Interactive Web Projects, Internet education, school districts links and professional resources links.

Subjects Links has links to multiple subject areas, shop links as well as homework and multicultural links.

Community Links has links to the Connecticut organizations like the Connecticut State Department of Education, ***ConneCT***-State of Connecticut informational site, and local news and media sites.

Lessons Database: CAPT Thematic Units, Submit a Lesson, Lesson Plans page

CAPT Thematic Units has samples of Integrated Thematic units with lessons developed by teachers in our school system to help our students meet the objectives of 10th grade CAPT (Connecticut Achievement Performance Test). The unit on ***Cloning*** aims at developing skills specific to the interdisciplinary segment of the CAPT Language Arts. The unit on ***Newspapers***, complete with lesson plans and worksheets, teaches students how to be critical newspaper readers.

Submit a Lesson Plan is a template that allows anyone to submit a lesson plan and get it instantly published on the site.

Lesson Plans displays submitted lesson plans. Make sure that you proofread your lesson plan before you submit it.

ICT Training for Teachers: a University response to a National Training Initiative in the United Kingdom

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Abstract This paper seeks to describe a national training scheme currently operating in the United Kingdom, the main aim of which is 'To raise the standard of pupils' achievements by increasing the expertise of serving teachers in the use of ICT in subject teaching, to the level expected of Newly Qualified Teachers who enter the profession, and by improving the competence and confidence of school librarians in their use of ICT'. An analysis of the requirements and learning intentions of the scheme are offered and examples shown of how one training provider has met the challenge using a combination of multimedia CD-ROMs, on-line training modules, in-school support and the development of a virtual learning community.

> "The Lottery-funded training... will focus on helping teachers to use the technology in the classroom to enrich teaching and learning and raise standards - right across the curriculum."
>
> \- People's Lottery White Paper, July 1997

The People's Lottery White Paper in July 1997 stated the aim of helping teachers make the most of the new resources being placed in schools. It led to the formation of the New Opportunities Fund (NOF) ICT Training Initiative. The New Opportunities Fund is a National Lottery Distributor created to award grants to health, education and environment projects throughout the UK.

The New Opportunities Fund ICT Training Initiative

The training started from April 1999, and runs over three years. £230 million has been made available from NOF, to fund the training of serving teachers and school librarians in all maintained schools in the UK, in an initiative for which the expected outcomes are defined by the Teacher Training Agency (TTA).

The main aim of the ICT training initiative is to raise the standard of pupils' achievements by increasing the expertise of serving teachers in the use of ICT in subject teaching, to the level expected of all Newly Qualified Teachers. To ensure that the training focuses directly on helping teachers and school librarians to use ICT appropriately and effectively, Expected Outcomes have been developed by the TTA (http://www.teach-tta.gov.uk/ict/nof). The Expected Outcomes define the knowledge, understanding and skills necessary to make sound decisions about when, when not and how to use ICT in subject teaching. It is intended that training provided under this initiative will integrate training in ICT skills with training in the use of ICT in the classroom.

The University of the West of England Faculty of Education

A number of Training Providers have been approved by NOF, of which the ICT Learning Path from the Education Faculty of the University of the West of England is a National Provider for both Primary and Secondary phases of education. Every state maintained school has been sent a Catalogue of Approved Providers by NOF (available from the NOF web-site www.nof.org.uk), and once the funding for an individual school has been approved through the Local Education Authority, the school chooses of Training Provider.

The Faculty of Education of the University of the West of England has over 1000 students currently training to be teachers and a further 600 students who are qualified professionals following post graduate courses of study in a flexible modular programme of awards. The Faculty of Education provides professional development for teachers in seven LEAs and has partnership arrangements with nearly 400 schools for initial teacher training and in-service work. The Faculty of Education aims to train competent professional educators who have the subject knowledge, the pedagogic skills and the personal capacities necessary to enhance the educational opportunities and educational achievement of all whom they teach.

The Faculty of Education made a first bid for Regional Provider Status in November 1998 and learned that the bid had been successful in February 1999. The original bid was made because the Faculty believed it had an important contribution to make to the development of training in the use of ICT underpinned by the same pedagogical principles adopted for all training at the Faculty. The Faculty has formed the view that its aims are best achieved through courses of training which adhere to, and are informed by, the principles of reflective pedagogy. Put briefly, that teachers should be offered a balance of academic study and practical experience, and critical reflection on both. Critical reflection, it must be emphasised, is not a passive, contemplative activity, but a key element in the evolution of effective professional practice. As training materials were developed it became clear that the training solution could be delivered to any school in England and so the Faculty bid for National Provider status in July 1999 and were awarded national status from November 1999. By February 2000, the training materials were ready and were published as the ICT Learning Path.

The ICT Learning Path

The ICT Learning Path is a training programme combining on-line subject modules, multimedia interactive CD-ROM materials, in-school support and bespoke training, and on-line subject and technology support. The training usually begins with an on-line audit of skills supplementing the TTA Analysis of ICT Training Needs CD-ROM and the National Grid for Learning (NGfL) on-line audit of Using ICT in the Classroom. The trainee then plans their route through the materials using the Statement of Intent completed with the help of their in-school training co-ordinator (a senior member of the school staff) and the school trainer. The school trainer is appointed to the school from a national team of trainers appointed as Visiting Lecturers of the University.

Trainees work through the materials either independently or in collaboration with their Learning Support Assistants, other teachers in the department or Key Stage, or in the case of small Primary schools as a whole staff. They either work through the relevant subject modules and support their training with IT skills and classroom applications from the CD-ROM materials, or begin with some modules from the ICT Learning Path training modules to gather sufficient confidence to move on to the subject modules. Although the NOF funded scheme does not include Learning Support Assistants, the Faculty took the view that we should offer free training to all LSAs, due to our philosophical commitment to work with all professionals who impact upon the educational opportunities for pupils.

During training, teachers and LSAs can contact tutors and their school trainers at the Education Faculty and submit their responses to tasks and exercises for review by a subject tutor. To finish training, teachers and LSAs complete an Exit Audit of using and applying ICT in the classroom. In this audit trainees compare their professional judgement against that of the course team about when ICT should and should not be used in subject teaching. The responses to the exit audit form part of the 'portfolio' created by trainees to share with senior managers within the school, as evidence of successful attainment of the expected outcomes of the training. Completion of training is not an end for teachers and LSAs; rather, it is the end of the beginning. Trainees action plan for the continuation of professional development using materials and additional training available from the University's web site, 'Pathways' (http://pathways.uwe.ac.uk) and from other sources including the National Grid for Learning. (http://www.ngfl.gov.uk/)

Her Majesty's Inspectors of Schools are currently monitoring the impact of current ICT initiatives in schools, including the New Opportunities Fund (NOF) ICT Training Initiative, and will publish a report in Spring 2002. The provision of such large amounts of public money for a school-based training initiative is unprecedented in the history of education in the UK. The Inspectors will, no doubt, be able to tell the teachers and the wider community whether such an investment is 'helping teachers to use the technology in the classroom to enrich teaching and learning and raise standards - right across the curriculum.'

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Networked Learning: A Project-based Approach in building up the Working Knowledge of Multimedia Teaching Resource Bank

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Abstract This is a working paper describing a proposal for the development of a networked learning program for participants taking "General Studies" as their elective in the part-time Postgraduate Diploma in Education (PGDE) course offered by the Hong Kong Institute of Education. The objective of the networked learning program is to develop a local multimedia teaching resource bank for the subject "General Studies" in the primary curriculum through collaborative learning. The paper describes the rationale and concept of the networked learning program. The mechanism with 4 stages of development is outlined to illustrate how the networked learning program should be designed. The outcomes, and limitations of the use of the networked learning in developing multimedia teaching resource bank are discussed too.

Working knowledge

Stepping into the new century, it is argued that the traditional education system has to be reviewed. Especially in the adult education, traditional University with fix time, space and curriculum cannot satisfy the "Life Long Learning Objective" of the adult learner. In order to satisfy the "Life Long Learning Objective", learning should be taken place independent of time and place, and can be available at all stages of a person's life. (Bates, 1995)

Education has a role to develop the "working knowledge" in their professional aspect. According to the SHARP project conducted by Goodyear (SHARP Guided Tour, 2000), much of what was learned in formal educational systems were proved not to be accessible outside the context in which it was learned. As a result, "working knowledge" has to be developed. In Goodyear's definition, working knowledge is the knowledge that learners have acquired and which they can use in unfamiliar, real world, problem-solving situations. (SHARP Guided Tour, 2000)

In another Project JITOL, Goodyear stated out several assumptions in the collaborative approach for the development of working knowledge. It was assumed that participants were professionals with lots of useful experience and expertise to share. The shared valuable knowledge in the field was bound up in the working practices of the professionals. And the participates would share their knowledge, opinion, descriptions of their working context and working practices, house methodologies etc, if they were given the opportunity and motivation to do so (Goodyear, 1995/6).

Putting Working knowledge in Hong Kong primary school context

It is agreed that learning should be put into context, and teachers should build up their working knowledge, which may not be taught in traditional college. It is a new concept in Hong Kong to develop the working knowledge of Information Technology (IT) among primary school teachers. And it is worth to start with the participants of the part-time Postgraduate Diploma in Education Course (PGDE) in the Hong Kong Institute of Education (HKIEd).

In order to apply IT teaching in primary school, a lot of multimedia teaching materials should be produced. This will definitely increase the workload of the teachers. Though there are plenty of educational CD ROMs in the market, most of them are imported from other countries that do not fit into the local context. Some teachers who have great interest in IT teaching, may have already developed some multimedia teaching aids; but many are still IT illiterate that they even do not know how to log on their personal e-mail account issued by the Education Department of Hong Kong.

In light of this, there is a need to develop a multimedia teaching resources bank shared by primary school teachers with the following objectives:

- To share the working knowledge among primary school teachers in the production of the multimedia teaching aids, which are not taught through formal education,
- To narrow down the IT knowledge gap among teachers, some teachers are IT experts while some other teachers are IT illiterate,
- To bring in the collaborative learning concept to primary school teachers, to help them to work together to face the rapid developed technology in education
- To reduce the workload of primary school teachers in the production of local context multimedia teaching aids

Networked Learning in developing multimedia teaching aids

Networked learning may be cost-effective in distance education based on relatively small-enrolled numbers of students and a frequently updated curriculum. (Goodyear, 1995/6). It is the most economic and efficient way to set up a networked learning course first with participants in the part-time teacher education program to achieve the objective of building up the working knowledge in IT teaching. No additional class, venues, lectures and other hardware are needed to organize on such networked learning activities.

The Directed Collaborative Project Model described by Goodyear was taken in building up the networked learning program. This model was developed from the organization of peer interaction occurred in the context of the part-time MS program. The objective of the program was about the continuing professional development and updating through computing mediated conference where interaction is the essential feature of the conference. (Goodyear, 1995/6). The objective of the interaction is to create an information resource bank, or evolving knowledge base containing structured representations of practitioner knowledge and research-based knowledge. On the other hand, according to the SHARP project, putting multimedia in network includes the putting of video, audio, graphic and text. (SAHRP Guided Tour, 2000) However, to produce a video clip for teaching materials is really a problem for most of the teachers of Hong Kong.

In order to solve the technical problem of video production, a video server is built in the Education Technology Services Unit of the HKIEd. A resources bank containing about a hundred video clips covering the "General Studies" subject in MPEG format are stored in the video server. The content of the video clips is produced according to the General Studies curriculum, and video clips run from 30 second to two minutes. Video clips from the resource bank can be inserted and integrate into the multimedia teaching aids. The PGDE participants could log on the Institute Intranet to download the video clips.

With the support of this video clips resource bank, the condition for developing local context multimedia teaching aids in "General Studies" through networked learning is built up, with the principle to help the participants to create an audio visual representation of key teaching concepts in General Studies. And the representation of these teaching concepts can be edited and shared through network to other participants in order to build up their own practices and professional perspectives. (Goodyear 1995)

The networking learning concept is adopted from the model of Goodyear about collaborative learning: a group of participants collaboratively create a working knowledge through network. The participants are situated at different location and can join in the computer mediated conference either synchrous or ayschnorous. (Goodyear, 1995/6)

As indicated in a number of research and articles, the successful of the networked learning depend on the active participation of members through interaction. It is also suggested by Salmon (1998) with the constructivist approach, that emphasis should be put on creating an atmosphere of openness, helping students to explore ideas and different interpretations, encouraging ownership of the learning and linking to previous learning. The mechanism to maintain the interaction and active participation of the participants is outlined in the following paragraphs.

The mechanism in developing multimedia teaching aids

The mechanism of building the multimedia teaching aids is inspired by two studies. The first one is the SHARP project which is through the Internet to facilitate computer-mediated conference to build up working knowledge with video representation. (Goodyear & Steeples, 1999). The project was about to create video clips for representation of working knowledge and sent into network for collaborative learning. Another study conducted by Hodges and Mott was about using project-based approach to construct web-based hypermedia for instruction via the Internet. The target of the project was for the pre-service and in-service teachers on using HyperStudio software in elementary school classrooms. (Hodges and Mott, 1999)

Based on the two projects, it is found that Internet is a successful medium for the interaction, and the hypermedia software can be shared in the Internet for members. The successful of the network conference is depended on the successful of the interaction. Therefore, the mechanism is mainly through Internet and the Intranet within the Institute, and through the using of Microsoft PowerPoint where the working knowledge in the preparation of multimedia teaching aids can be shared.

The mechanism of the interaction for networked learning is mainly divided into four stages, and facilitated by the tutors. The medium for networked learning is the Institute e-mail system with connection to the video server of the Intranet. The advantage of using the Institute e-mail system is that all the participants have already familiar with the system and no additional orientation course is needed.

Stage I

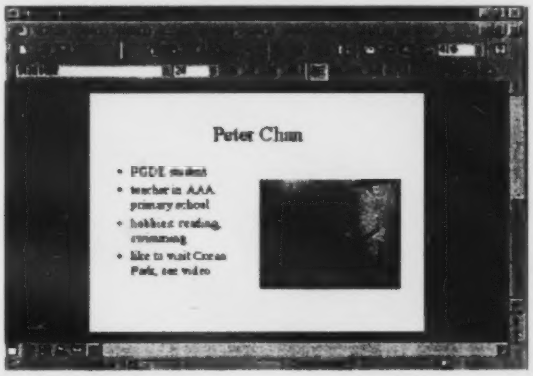
According to Hodges and Mott, it is the stage for the participants to introduce themselves to the rest of the class and at the same time, to master the software such as acquiring image in the Internet (Hodges and Mott, 1999). In order words, participants should get use to the technology in computer-mediated conference, and the most important, to try to post something in the conference and start out the collaborative learning atmosphere.

During this stage, participants are encouraged to produce simple descriptions about themselves with Microsoft PowerPoint; a 30-second video should be inserted in the MS PowerPoint with whatever content they like. The video inserted can be produced by themselves or they can make use the video clips stored in the video server of the Institute. Technical support will be provided to help participants to upload the video clips to the

video servers. Therefore, all participants within the group can view each other MS PowerPoint with video clips. Figure 1 is a sample layout of the PowerPoint. The advantage of using MS PowerPoint with video clips inserted from the video server is that they can attach and share with all users within the Institute Intranet system.

At the same time, the participants are encouraged for joining the computer-mediated conference. The role of the tutor at this stage is to ensure the participants are welcomed and motivated, and can be helped to gain access to the system. (Salmon, 1998)

Fig 1, Sample PowerPoint layout, with video inserted from video server



Peter Chan

- PGDE student
- teacher in AAA primary school
- hobbies: reading, swimming
- like to visit Ocean Park, see video

Stage II

According to Hodges and Mott, a project-based approach in online instructional design will provide teachers with a real-world learning environment task, and as a result, will utilize their strengths to construct the technology skills for use in classrooms. (Hodges and Mott, 1999)

In order to create a collaborative learning environment, tutors should set out tasks for the participants to develop the multimedia teaching aids. Participants are free to select any topic. For example, if a participant

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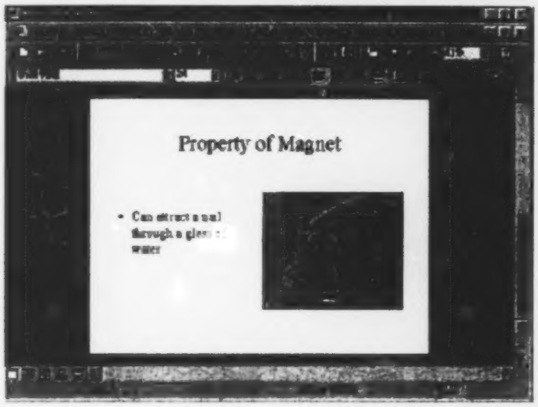
is a primary school 1 teacher and he/she wants to produce a multimedia teaching aids about the property of Magnet. Then he/she can prepare the MS PowerPoint and insert the video clips about the property of magnet from the video server. Fig two shows the simple layout of prepared PowerPoint.

After that, the participant is encouraged to attach the PowerPoint file in the e-mail and send to other members. Other members are free to discuss, comment or amend the PowerPoint. Participants are also encouraged to ask any questions about the task, such as the technical problem of video inserted, audio inserted, sequence of animated effect in title, text and video etc. The purpose of this stage is to facilitate participants to get use of the e-mail conference and the technique of the production of multimedia teaching aids.

Figure 2: Showing a the layout of PowerPoint prepared by Participant A



Property of Magnet

- Can attract a nail through a glass of water

The role of the tutor in this stage is to let the participants appreciate the social environment of the conference system and to learn to join in. The response of the e-mail to each other may be largely individual but the tutor should encourage them to make them in public because the students may still need individual emails for support and direction. (Salmon. 1998)

Stage III

At this stage, the participant will use the MS PowerPoint produced in stage II and implement in their real teaching community. It is a real situation to integrate their teaching theory into context of working knowledge about building multimedia teaching aids. To the participants, this is a new experience to them because the application of IT teaching is still uncommon in Hong Kong. This is the stage for the participants to discuss the production and implementation of the IT teaching. The participants are free to discuss the application of learning and teaching theory, the instruction design and the technical problem in IT teaching. At this stage, the role of tutor is gradually fade out and allow participants actively build up their own working knowledge through interaction and collaborative learning. Salmon described this stage as information giving and receiving. The students may appreciate the huge range of information available through the network system, and his/her ability to contribute. (Salmon, 1998)

Stage IV

After thorough discussion through the network, the participants have exchanged their own experience in the application of multimedia teaching aids in the context of primary school teaching. With others' comments, participants will modify their teaching aids, and if possible, implement again in the classroom. At a result, a multimedia teaching resource bank is built among the participants so that they can share with each other and to use in the real situation. Reaching this stage, the participants have gone through the collaborative learning cycle as described by Goodyear. (Goodyear, 1995/6). Salmon described this stage as knowledge construction. It is at this stage that the students work together to generate and make new meanings through their collaboration.

Finally, the evaluation of the effectiveness of networked learning can be done with participants writing a self-evaluation report about what he/she has learnt in the program.

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Outcome of the Networked Learning in developing Multimedia teaching aids

A multimedia teaching resource bank in General Studies will be built with the contributions from participants from in-service teachers of Hong Kong. In Hodges and Mott's project, the class of students had developed a true team relationship, and had assisted each other when problems emerged and finally had taken lead roles in facilitating each other through the learning process (Hodges and Mott, 1999). In view of knowledge construction, the students had engaged in discussion and interaction with peers and experts in a process of social negotiation. Knowledge construction did occur among students through discussion about their positions, in an argumentative format, reflection and re-evaluation their positions (Salmon, 1998). It is believed that under the networked Learning program, participants will go through the process of computer-mediated conference and as a result, they will collaboratively construct their working knowledge in developing multimedia teaching aids. They will learn how to organize discussion in network, and understand how to post response, argue and suggest to others during discussion. They will also learn how to produce multimedia teaching aids with the integration of audio, video or text. This is the working knowledge constructed by them and can be applied in their future practice.

Limitation in developing Multimedia Teaching resource bank through network learning

Using E-mail system for computer-mediated conference

According to Goodyear, in the early years of the MSc course of Lancaster University, the main means of communication was e-mail, and which was best suited to one-to-one or one-to-small group communication. However, Goodyear had concluded two main problems for the using e-mail system for computer-mediated conference.

1. Confusion over the addressing of messages
2. Misfiling of message (Goodyear, 1995/6)

The e-mail system is designed basically for an efficient way of information exchange, but not for computer mediated conference. In view of the existing hardware and software of HKIEd, the e-mail system with Internet is the only economic way for the conference. However, there is a lot of limitation as described by Goodyear.

For example, it is proposed to insert video to the MS PowerPoint and attach in the e-mail system. This will cause a lot of burden to the storing capacity of the Institute network. If the file size is too large, it may even break down the system. One way to solve the problem is that the student can create their own homepage and put their MS PowerPoint in the World Wide Web. The students need only to e-mail their homepage address to others members and will not give too many burdens to the Institute network system. However, creating homepage needs a lot of IT knowledge and not all students have adequate knowledge to do so.

The storing capacity of the e-mail system is another limitation. Due to the limited storing capacity assigned to each student, his or her email box will easily be full if for he/she takes active participation in the computer conference. As a result, students have to delete their e-mail messages from time to time. Then the retrieval of past message and the reviewing of the conference will be a problem.

Tutor role in facilitating the active interaction of the participants

The tutor plays an important role in facilitating the interaction of the participants in network learning. If the students do not actively involved in the interaction, the tutor can't do anything. Though the students have shared objective to construct the working knowledge in the context of the primary school, there are some other factors restrict them from actively involved in the interaction. The factors will be

- Heavy workload in the primary school
- PGDE students do not have adequate knowledge in using the technology in conference
- The personality of Chinese are reluctant to confront with others during discussion
- English is the second language of Chinese. To design a networked learning programme in Hong Kong the medium of language for interaction must be considered. Ideally it should be Chinese, but the Chinese input methods are still a barrier to a lot of Hong Kong teachers. Lack of knowledge in Chinese input will restrict students taking active participation in the conference.

Task for Collaborative Learning: Production of Multimedia Teaching Resources Bank

In designing the networked learning, the task of collaborative learning is to produce the multimedia teaching resources bank. This is under the assumption that there is an urgent need for the primary school teacher to implement the IT teaching in school. However, there is a lot of limitation in the primary schools to implement the IT teaching. For example, there is not adequate number of computers in the primary schools. Some of the primary schools are still waiting for the Education Department to allocate budget to install the computer network system in their schools. At the same time, some hardware provision is needed but not so common in the primary school setting. For example, the fixed LCD projector has not been installed in the most of the Hong Kong primary school classrooms. All this hardware provision will restrict the PGDE students to implement the IT teaching. As a result, they cannot take an active role in the networked learning conference about the production of multimedia teaching aids, due the reason that they do not have any experience to share.

Conclusion

The development of networked learning with PDGE participants and the building up of a multimedia teaching resource bank through collaborative learning are based on the fact that there is a shared objective among the participants. The shared objective is to apply IT in teaching strongly encouraged by the Hong Kong Government. Other than the formal training courses, the networked learning may be a good mean to help the participants building up their working knowledge in application of IT teaching in the local context of Hong Kong.

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Wholetheme Learning in the Internet Virtual Community: Some Encouraging Preliminary Results

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Abstract: This study compares data from two different applications of a theoretically grounded wholetheme learning portfolio. The portfolios came from four different sections of the same undergraduate educational psychology course for teacher education students. All students wrote a critical reflection essay on three of their major insights in the course of the semester according to a common schedule and set of guidelines prescribed in their syllabus. Each of the students in two of the sections did and in the other two did not participate in the internet virtual community (IVC) we created. Quantitative results suggest that the IVC participants improved in critical reflection in the course of the semester. Qualitative analysis of the third insight data suggested a trend in favor of an interaction in which better students did better in IVC and poorer students did better in non-IVC conditions.

Introduction

The Wholetheme Learning Portfolio

The results reported here are based on critical reflection on three insights as part of more comprehensive wholetheme learning portfolio (WLP). The WLP is a product of over two decades of research in biofunctional cognition (Iran-Nejad, 1980, 2000) and close to a decade of application in university courses in educational psychology for teachers. One major difference between the WLP and traditional teaching products is the conceptions of learning behind each of the two kinds of artifact (Iran-Nejad & Gregg, in press). These conceptions of learning are presented in Table 1. Whereas the focus on the first two conceptions of learning is on *internalization* of an external disciplinary knowledge base, the third conception views learning as the wholetheme *reorganization* of the learner's own intuitive knowledge base. Critical reflection as reported here was based on this third conception of learning.

Conception of Learning	Metaphor	Shared Characteristics
1. Internalization of External Knowledge by Means of Maintenance Rehearsal	Learner is Like a Clothes Buyer	Acquiring and Storing Ready-made Objects
2. Internalization of External Knowledge by Means of constructive Elaboration	Learner is Like a Dress Maker	Building Objects Using Ready-made Patterns
3. Wholetheme Reorganization of the Learner's Own IKB	Learner is Like a Designer	Inventing New Designs using One's Own IKB

Table 1: Three conceptions of learning based on Iran-Nejad (1990) and their illustration in terms of the metaphor that knowledge is analogous to Clothing.

Specifically, one major implication of the different learning conceptions, as far as the WLP is concerned, is a fundamentally different perspective on critical reflection. The object of critical reflection in the first two conceptions of learning is the declarative or procedural content of a symbolic input stream whose origin is, directly or indirectly, an external disciplinary knowledge base (indirectly, that is, if the message stream comes from a previously internalized representation of that external knowledge base). The kind of critical reflection processes that are assumed to operate on the symbolic and representational message stream are analytic examination of its content, constructive elaboration on it, and/or storage-for-reproduction of it. Critical reflection in the third conception of learning is an entirely different story. It involves turning inward, rather than outward, to one's own non-disciplinary intuitive self-awareness and learning to use it in the art of self-regulating one's own brain-mind cycle of reflection for the purpose of wholetheme reorganization of one's own nonsymbolic and nonrepresentational intuitive knowledge base (Iran-Nejad, 2000). As secondary and indirect objects of critical reflection, external knowledge bases (both disciplinary and non-disciplinary), one's own knowledge of the world, and social nonsocial organizations of learning are all only useful to the extent that they can contribute to the primary goal of self-regulating one's own brain-mind cycle of reflection. The purpose of the WLP is to help students embark on this type of a journey of their lifetime that must also be, in some extraordinarily fundamental sense, a journey of their own choosing.

The Concept of Internet Virtual Community

Because the nervous system and the learning processes of the brain-mind cycle of reflection have evolved in the real world, the internet social and otherwise organizations of learning are likely to facilitate learning to the extent that they can manage to approximate the social and otherwise organizations of the real world. We designed the IVC to "actualize" this other implication of biofunctional cognition. In real world communities, people live in homes which are nothing like the artificial modern classrooms. People prepare their homes maybe first to their own liking, comfort, and entertainment and next to the liking, comfort, and entertainment of their guests. To harness a parallel set of considerations, we made every individual student in the course the proud owner of an IVC home in which to post her or his wholetheme learning portfolio. The homes for the students in each section of the course were also designed into communities of five to seven homes. Within a given community, the owners maintained open house for the duration of the semester for visitation by other members of the community. At the end of every scheduled visit, the guest was to leave a critical reflection and three other brain-min-cycle of reflection ratings of their own experience of the visit.

Methodology

Insight critical reflections (or insights, for short) from 84 portfolios authored by the students in an educational psychology course for undergraduate teacher education candidates were used as the data source. The portfolios came from four different sections of the same course. Most of the participants were white, female, and about twenty years old. There were two different instructors, both advanced educational psychology graduate assistants. One of the two sections of a given instructor participated in the IVC and the other served as the non-IVC equivalent (control).

Each student in an IVC section received sign-on instruction to her or his own individualized "home discussion forum" (HDF) as well as to the HDFs of the other members of the same community. The

HDF enabled its owner to post her or his portfolio entries or view responses posted to each entry by other members of the same community or by the instructor. Each community consisted of five to seven HDFs for all members to visit.

All four sections received the same course syllabus, except that the syllabi for two of the sections contained additional instructions for participating in the IVC. Instead of posting them in an HDF, participants in the non-IVC sections e-mailed their portfolio entries to their respective instructors. All entries were posted or e-mailed according to the same schedule prescribed in the syllabus. Students in all sections were also required to compile all their entries into a custom-designed hard copy of their portfolio and turn it in to their instructor for grading purposes by a deadline toward the end of the semester. Thus, each student was required to submit each entry twice, once by posting or e-mail according to a prescribed schedule and once in hard copy included in compiled portfolio. In this fashion, the IVC and the non-IVC sections were different only in that the IVC sections made their portfolios public within their community. In all other aspects of instruction, including their regular class meetings, all four sections of the course were to be identical.

The wholetheme learning portfolio was described as a QUILT (RR) portfolio, denoting its content types: questions, insights, lessons, and teaching observation essay as well as a (summative) reflection paper and a (summative) reaction to the portfolio. In this study, we only analyzed the insights. Therefore, the other contents of the portfolio will not be discussed here. For each month during the semester, each student was to reflect on her or his major insights for that month, select one of them, and write a critical reflection on it.

Quantitative Results

Each insight was rated by two raters on a critical reflection scale. There were a total of 248 insights to rate. The inter-rater reliability was 0.85. The ratings of each insight given by two raters were averaged. A preliminary analysis showed no main or interaction effects for Instructor. Therefore, a 3 x 2 repeated measure ANOVA was conducted on the ratings with Time (Insight 1, Insight 2, Insight 3) as the repeated measure and Condition (IVC, non-IVC) as a between-subjects factor. A significant interaction was present, $F(2, 156) = 3.195, p < .05$). However, none of the main effects were significant. As Figure 1 shows, IVC sections gained in critical reflection from Insight 2 to Insight 3. The critical reflection scores for the non-IVC students went down.

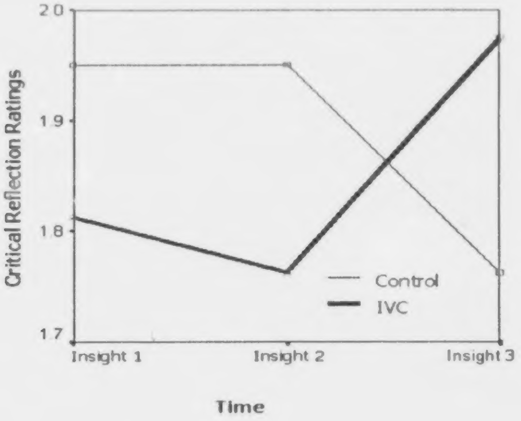

Figure 1: The interaction of time and condition

Qualitative Analysis

We used NUDIST (Q.S.R., Power version, revision 4.0) for a closer look at the data for Insight 3. Upon examining the categories that emerged, we noticed a tendency toward an interaction in which the IVC participants in the top group appeared to be doing better than the control group; but the IVC participants in the bottom group seemed to be doing worse than the bottom control group. Table 2 (See Appendix) shows a sample of the coded sections. To select this sample, we used the criteria of best, common, and worst examples of learning as reorganization. To our estimation, examination of the insight excerpts in the table seems to support the tendency for the interaction we just described.

Discussion and Conclusions

What can we make of this preliminary set of results? According to our quantitative results, participation in the internet virtual community seemed to help between the time that the students wrote their critical reflections on their second and third insights. This was expected. However, during the same period, the opposite effect is apparent for the control students. This was a surprising finding. One tantalizing possibility is that sometime by mid-semester, the IVC participants experienced a crisis in the process of wholetheme reorganization of their own intuitive knowledge base. This crisis then interfered with their critical reflection performance for the second insight. For the non-IVC students, this developmental crisis came a month later affecting their critical reflection performance on their third insight. Whether there is any substance to this highly conjecture remains to be seen.

Our qualitative analysis of the data on the third insight was conducted to see if it could shed any light on the above conjecture. The actual results seem to be cautiously helpful. By the time of the third insight, good non-IVC students seemed to be only slightly behind the good IVC students, indicating that they had already left their wholetheme reorganization crisis behind and were well on their way to recovery from it. Why did, then, the poor IVC students perform worse than the poor non-IVC students. It is possible that the poor IVC students only appear to be doing worse because they are experiencing their wholetheme reorganization crisis at the time of their third insight. The non-IVC students appear to be doing better only because they have not yet reached the wholetheme reorganization phase. The data in Table 2 are consistent with this speculation. It is important to know that this cannot be anywhere near a conclusion. Without further evidence and without any replication data, many similar conjectures can be fabricated for the pattern of results reported here.

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	Top Group		Bottom Group	
	IVC sections	**Non-IVC sections**	**IVC sections**	**Non-IVC sections**
Best Wholetheme reorganization example	In the above paragraphs, I basically just explain confidence and its importance. However, along with confidence, I think the next best thing to achieve is independence-one's own sense of identity. It took me a while to achieve this one-my parents tried their best to keep me under their wing, but I feel that I have finally broken away. When I speak of independence, I do not just mean being able to support oneself financially. Independence can be used in a variety of different contexts. I bet you are wondering how on earth I would go about teaching independence to a kindergartner. The kind of independence I would show this age group is to rely on their own thoughts and imaginations instead of someone else's thoughts and imaginations. This is the context of independence I would most stress during teaching. This is where confidence ties into independence.	There was now a clearing in my mind; a new path had been opened. This new path indicated a great new set of possibilities for me in my own approach to my studies. The insight helped me to sort out things in my mind very much the same way as one sorts out clothing from a laundry basket or food items placed in appropriate parts of the kitchen. My mind could not go down old paths any longer. I resolved to be in control of my self-regulation in terms of my own motivation in my studies. The challenge had been given and now I had decided to accept the challenge within myself. Only I could make this step. Mental adjustments had to be made. It was not all-smooth sailing in my mind to make the crossover to improve my mental attitude. I will now deal with an experience I had many years ago in relation to this insight.	At the same time, I was listening to one of my gospel CDs. The song that was playing said, "Oh what peace we often forfeit; oh what needless pain we bear, all because we do not carry everything to God in prayer." From that I realized that not only was I forfeiting my peace and happiness, but I was also worrying needlessly. For every time that my mind could not see a way, God made a way. I also realized that all I had to do was pray about my financial situation and any other problems that I may have been having at the time; and leave them there with God, everything would have been taken care of.	While in my placement at Woodland Forrest Elementary I witnessed a lot of different things. One of the most profound however was the effect that motivation has on children even in kindergarten. All children are not driven to achieve but some can be with the help of a little motivation. Ms. Teacher was very good at this. She motivated in so many ways that it was hard not to want to do your work. One of the ways she motivated was the star chart. Good behavior got a star for the day and the children with the most stars at the end of the week go something special. It's almost like the children were feeding off this motivation. However I thought to myself that maybe she was giving too much motivation at times. Then I reconsidered because how can you measure too much motivation. I see that if any class is to succeed, it has to be driven to.
Most common Non-wholetheme non-reorganization example	After putting thought into my insight, I now have a basis for what type of teacher I want to be. By having this insight, it has given me the ideas and qualities that expert teachers possess in order that one day I may achieve the expert teacher status. My insight has shown me that there is a large difference between an expert and novice teacher. All of my sources of knowledge tell me that I have a long way to go before I fully understand the big picture of an expert teacher. However, by having this insight and all of the information learned from it, I know that the learning process is already in motion.	It is difficult to find sources of motivation for students with disabilities, especially those with limited communication skills. I have discovered that one opportunity for teaching may arise when a student has a desire for an object or task. When working with students in the future I plan to be more observant. I now realize that the students can guide me in the development of individual instructional programs.	Another question I have is how are the other students handling the fear of going to school. After the shooting was done in Columbine many students for at a weeks time were absent from school, and this only hurts them. How could blame a student who is in fear of their life at school of all places not to come? The answer is you don't. Extra protection is the only solution that the schools can give right now and there doing everything in their power to keep students safe.	This insight transformed me as a person because it made me look at motivation in a totally different way. It made me realize that I can use both external and internal motivation, yet neither one would be used in the bad sense. Now I can make sure that I only try to use external motivation to stimulate internal motivation. (31)
Worst non-wholetheme non-reorganization example	I think that this insight has transformed me to an extent as a teacher. I cannot expect my students to just want to do well just because they are all driven to do well. I will have to give some incentives for some of them to want to do well. Some may never be motivated towards doing well in school, and I have to make sure that I don't give up on these students at first sight. I will have to look hard to find what does motivate them and tie that into my classroom experience so that they will be motivated to learn. Without this insight, I may have just assumed that these students just didn't have a drive as powerful as mine.	I could have offered the students a reward if they would of eaten a well-balanced meal for a week. I could have also told the students the consequences from not eating from all the 6 basic food groups. This way the students would be able to decide which road they want to choose in healthy eating. In this situation, I could not have used the punishment style of motivation because I could not have taken away something from the students just because they were not eating right. I usually do not eat right myself, much less punish the students for something I do, too. Therefore, I learned there is an appropriate place to use one motivation skill and another place to use the other.	Why did I choose elementary education over obstetrics? I have always wanted to be a teacher, but I also wanted to deliver babies. I really thought, I would be much happier teaching than delivering babies. Then I thought, doctors make about five times as much as teachers make, but what do I really want to do? Doctors are always on call, unlike teachers. Would I enjoy this environment of constant pressure in a hospital or do I want a more relaxed environment in a classroom. … Therefore, I chose teaching.	My name is S and I teach third grade. One of my students went through a traumatizing event not to long ago. He found his mother dead in their house. She had a massive heart attack. Well since this terrible occurrence, he has started to block a lot of things out and to forget things. His father put him through counseling but he seems to be progressing very slowly. He is a very smart boy, always made really good grades. Now he has forgotten things he use to do really well on for example division. So it is obvious that he is forgetting information from his long-term memory.

Table 2: Best common and worst examples of text units from insights by top and bottom groups of students in IVC and non-IVC conditi

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Constructing Knowledge Networks in Middle School Science Classrooms

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Abstract: Providing opportunities for K - 12 educators to further their use and understanding of current technologies in the classroom has never been more important than it is at present. This paper will explore ways that university faculty members can provide K - 12 educators with relevant information and hands-on experiences to develop and enhance their use of technology in the science classroom.. An interactive workshop for 15 middle school science teachers provided an opportunity for participating teachers to experience constructivist teaching and learning strategies first-hand. Throughout the workshop, teams of teachers worked to prepare an integrated, technology-based lesson using materials from science, mathematics, as well as the language arts. Highlights of the curriculum developed for the workshop will be presented. Results of a questionnaire given to the teachers will also be shared.

Introduction

Through a Dwight D. Eisenhower Faculty Development Program award, a team of faculty members and graduate students from American University hosted a workshop on the American University campus for a group of 15 middle school teachers from the District of Columbia Public Schools. Teams of three were identified with most teams including a science teacher, a mathematics teacher, and a language arts teacher. Where possible, teams consisted of teachers from the same school. Resources for the workshop can all be found at http://www.american.edu/IRVINE/ike/. The weeklong, interactive workshop provided an opportunity for participating teachers to experience constructivist teaching and learning strategies first-hand. During the week, the teams of teachers worked to prepare an integrated, technology-based lesson using materials from science, mathematics, and the language arts. In the section that follows, highlights of the many workshop activities are outlined. A table summarizing the workshop events is given in the appendix of this report.

Theoretical Framework

The need for the successful implementation of technology into any educational program, especially the innovations within middle school classrooms, must be build upon a genuine educational pedagogy in order for authentic learning to occur (Dede, 1999). The constructivist model has emerged from the works of developmental theorists such as Bruner, Piaget, and Vygotsky. The cognitive constructivist theory adopts the works and conclusions of Bruner and Piaget as the foundations of its principles. Within this theory, students construct their knowledge of the world through assimilation and accommodation. Within the field of educational computing, the best-known cognitive constructivist theoretician is Papert (1993), who characterizes behavioral approaches as "clean" teaching, and constructivist approaches as "dirty" teaching. The contrast emphasizes the difference between perspectives that isolate and break down knowledge to be learned (clean) versus approaches that are holistic and integrative (dirty) (Papert & Turkle, 1993). Intertwined together, at some level both "clean" and "dirty" approaches serve as the authentic foundations of the constructivist theory. By considering these approaches together, we can get a clearer understanding of how Internet technology, when integrated into any classroom, can be used to create successful distance learning in educational and corporate environments.

Another example of constructivism in educational technology is outlined by Dede and Sprague in a 1999 article, "If I teach this way am I doing my job?" which appeared in *Learning and Leading with Technology*. The article is based upon the constructivism theory at work in a traditional classroom. Educational technologists have often stated that an effective way to integrate technology into the teaching and learning processes is to follow a constructivist foundation. In other words, educators may have technical skills, but they may not understand how constructivism translates into effective, "hands on" classroom practice. However, the constructivist theory is in fact one of the best theories to intertwine into the daily classroom lifestyle (Dede & Sprague, 1999).

For an authentic constructivist theory to breed successfully in any classroom, students are expected to be more actively involved than in traditional classrooms. They are required to share ideas, ask questions, discuss concepts, and revise ideas and misconceptions (Dede & Sprague, 1999). In order to successfully ensure that the constructivist theory is in practice while using technology, the educator must in most cases change his or her more traditional beliefs. In the constructivist classroom described by Dede and Sprague there is no evidence of neatly lined desks or a type of "dense" order within the classroom walls. Instead, students work in teams, asking questions and moving about the classroom. In addition, the educator, instead of simply repeating a redundant lecture, is engaging in interactive activities with his or her students. The mission of the constructivist method is centered upon the needs and interests of the student. Any constructivist classroom demonstrates that learning can often times go beyond the content area. The main foundation the constructivist scenario is built upon states that authentic learning must be student-centered and meaningful and must encourage the student to engage in real-world experiences, thus allowing him or her to go further in his or her learning and education (Dede & Sprague, 1999).

There are many examples in which the constructivist theory has successfully been implemented with or around technology. Within the model constructed by Egbert, Thomas, and Fischler (2000), the Tigerlake Public School simulation is assessed through substantial research. The model mimics the following concept: if the constructivist theory is successfully implemented with and around technology, students learn authentically. In this situation, student-educators who are the participants in this simulation learn by doing. This simulation offers a way to integrate field experience and alternative technology-based instruction, which combined can help to improve almost any type of student to achieve high levels of competence in technology. The Tigerlake simulation allows the 29 student-educators to interact in a learning environment where "rich" experiences could be achieved. The richer the experience, the richer and more indelible learning takes place. By presenting related practices in learning environments that are simulated, the participants are provided with a set of "experiences" to compare to the current problem or issue. The participants are able to simplify concepts in order to make them understandable, in order to build upon existing understandings of theory and apply it to practice. Again, even among student-educators, the constructivist theory, intertwined with technology, is successful in allowing the participants to gain a better grasp of applying theory to practice (Egbert, Thomas & Fischer, 2000).

Design

The basic structure of the workshop involved sharing information and materials with the teachers during the morning sessions. This structure builds on known ideas about infusing technology into the instructional techniques of teachers, as many educators are experiencing a transformation in the ideology of "best-practices" as they once knew it (Balestri, Ehrmann, Ferguson, 1992). Although technology has influenced methods and practices in almost all-educational institutions (Balestri, Ehrmann, Ferguson, 1992), traditional pedagogy should still be used as the foundation for all educational practices (Bopry, 1999). The teams of teachers spent each afternoon in a computer lab learning how to use the internet and world wide web to create constructivist-based integrated lessons. Each afternoon, the participants met in the McCabe Center for Computers in Writing, a lab of Windows98 computers with access to the internet and web-design software. Teachers were given intensive hands-on instruction on educational web design, and created materials and resources to use in the process of integrate this instructional medium into their teaching in math, science, and language arts. Thus, the teachers were given a considerable amount of time to work together within their teams to plan and develop their lessons.

Each morning, the workshop began with a group discussion of the previous day's "reflection questions." Each day participants were given several questions to ponder after the conclusion of the day's events and activities. Participants were asked to go home and keep track of their reflections in a journal. The reflection questions were typically associated with information presented during that day's sessions. The intent of the reflection questions was to give teachers time to digest information they had received during the day, and to reflect on how that information might have relevance to them in their daily teaching activities.

Each day, participants engaged in hands-on activities relating constructivist perspectives into instruction in language arts, mathematics, and science. The participating middle school teachers were engaged by activities such as how to use a learning style approach in the classroom, reading the web using a critical literacy perspective, and an interactive; constructivist-based biology laboratory on DNA. Each day following lunch, participants went to a computer lab facility to work on their team projects. The sessions followed a teaching/training methodology for instruction in using the computer applications in the lab. First teachers discussed general principles of educational web design, and then participated in a whole-group training session on how to use the tools. Then teams were given lab-time to work on their projects with one-on-one assistance from the session leaders. Thus, participants had ample opportunity to ask questions and receive personal assistance from the workshop team.

The focus of the projects that the teachers created were around an integrated lesson that allowed the teachers to build on national standards in their own curricular area. The point of this focus was to have the teachers build a series of activities that would not only give their students the opportunity to construct their own knowledge, but also provide a interesting way to meet curricular standards. This allowed teachers to realize that alternative methods of assessment could be used to measure student learning, while still meeting the school district's objectives. Therefore, teachers could still feel they were "doing their jobs" -- in reference to Christopher Dede and Deborah Sprague's Question. For example, in an integrated lesson on the study of petroglyths, students could learn about something of interest, while still achieving learning standards in math, science, and the language arts. This activity allows students to examine this interesting field of study through mathematical activities, scientific methods, and using language and communication skills to show what they learned.

petroglyphs
a study of the southwest
Language
Science
Math

Figure 1: A sample constructivist learning project on the study of petroglyths

Feedback from Participating Teachers

On the final day of the workshop, feedback was elicited from the workshop participants in the form of a written questionnaire. The questionnaire was used as a substantive portion of the summative assessment of the workshop. A copy of the questionnaire is included in the appendix of this report. The questionnaire includes a summary of all comments given by the workshop participants. A brief summary of the feedback received from workshop participants will now be presented.

Numerical ratings given by the participants ranged from 3.86 to 4.93 (with 5.0 being the highest possible rating). The overall average numerical rating was 4.60. From these ratings it might be concluded that overall, the workshop participants were very satisfied with the workshop. Participants were asked whether they felt the goals of the workshop were achieved. Responses to this question clearly show that most participants felt that the goals and objectives were met, and in many cases, exceeded. In regards to the overall structure of the workshop, one participant commented "This was the 'best' professional development experience I have had in several years."

When asked how they intend to integrate what they've learned in the workshop into their own classrooms, participants indicated a definite eagerness to return to school and begin implementation of the new strategies. Several participants suggested that they planned to make better use of the web in their classrooms. In addition, one participant indicated that they would be making use of the constructivist approach as they work

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with and teach other faculty. Thus, the potential exists for other teachers at the participants' schools to benefit from the material shared in the workshop.

Comments from some participants indicated that they did not necessarily feel there was enough time for interactions to occur, especially between teachers from schools other than their own. The teams were structured such that most teachers worked with other teachers from their own schools. This was done to allow teachers to return to their individual schools and continue working together to further enhance what was learned during the workshop. In addition, these teams were encouraged by the workshop leaders to return to their own schools and share what they learned with other teachers.

Overall participants indicated that they felt the workshop was a valuable experience, worthy of being repeated in future summers. Some participants indicated that if the workshop were to be repeated it could even be extended to two weeks because of the amount of material presented.

Summary

Although many educators think that implementing the most high tech tools is the way to maintain successful educational practices, others bow to traditional theories. What is obvious is that many of the constructivist theories can be successfully implemented when intertwined with current Internet technologies. What seems to be needed currently is an understanding that the constructivist approach to learning can be implemented with the Internet, and if done so properly can be highly successful, taking educators and students where they have not been able to go in the past. For example, when teachers and students are actively engaging in Internet technology and implementing projects in such a domain (by building their own environments), they are simultaneously actively engaging in the learning of knowledge, within that domain. Students building artifacts on the web are creating creditable sharable externalization of their knowledge, which provides both motivation and opportunity to exercise meta-cognitive skills. As a result, students gain the ability to learn simply by applying the constructivist theory to their success factors when using the Internet. A passive view of integrating the Internet into education may only support instructions and techno-centrism (Papert & Turkle, 1993). Educational Internet resources will change this approach by allowing students some degree of autonomy in choosing their path of learning via computers. The Internet alone cannot produce "good" learning, however "good" learning can occur through successful implementation of the Internet (Papert & Turkle, 1993).

The goal of the "Constructing Knowledge Networks: Integrating Science, Math, Language, and Technology in the Middle School Classroom" workshop was to provide teachers with hands-on learning experiences and materials related to developing technology-based learning tools for use in Science, Mathematics, and Language Arts classrooms. Based on feedback from participants, the goals and objectives of the workshop were met and exceeded. In addition, participants encouraged workshop leaders to offer similar workshops in the future, focusing on a project-based approach to professional development.

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Beyond the workshop: Models of Professional IT Development for Practicing Teachers

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Purpose

This study examines an often over-looked aspect of the implementation of computer technologies in schools, across Canada and elsewhere: we have sought to identify, describe and clarify "successful" models of teacher professional development.

As the number of computers accessible to students and teachers in classrooms and labs has increased, especially in the last ten years, there has been a corresponding emphasis on "integrating technology across the curriculum." Teachers' effective use of computers in their classrooms, however, remains an elusive goal. Researchers have identified numerous barriers to teachers' use of computers in their classes, such as limited equipment, inadequate skills, minimal support, time constraints and the teachers' own lack of interest or knowledge about computers (see, for example, Berg, Genz, Lasley & Raisch, 1998; Ertmer & Addison, Lane, Ross & Woods, 1998; Hadley & Sheingold, 1993).

Rightly or wrongly, teachers have come "under fire" as insufficiently skilled to make use of promising new technologies. Governments, faculties of education, school districts, schools, communities and individuals have begun to focus on helping teachers get access to training and development in required skills. While programs have varied widely, we have chosen to focus on three exemplary models of professional development in Canada: a university-based model, a school-district model, and a school-based model. In each of these examples, we elucidate the methods and practices which support and hinder teachers in their technological professional development, focusing on teachers' own stated preferences for "what works" and "what doesn't work" as they attempt to make more and/or better use of computers in their classes.

Methods

We have employed several methodologies in our work: documentary research, site visits and interviewing. Through observations and semi-structured interviews with teachers, project developers and administrators, and we have identified a common range of issues that have been encountered when providing professional development to teachers.

Models for Professional Development for Practicing Teachers

A university-based model

The Teaching and Learning in an Information Technology Environment (TLITE) is a two-year post-baccalaureate program provided by Open School in collaboration with Simon Fraser University (SFU) in British Columbia. Open School is a division within the Open Learning Agency which provides programs (at a distance or in classrooms) geared toward the K-12 curriculum for students and teachers using print, television and Internet sources.

The TLITE program is designed specifically to aid teachers in using technology effectively in their classrooms; it is self-directed, collaborative and based on the mentor model. Over the two years, teachers meet face-to-face and on-line in their cohort groups (based on geographical area), with their "local" mentors ,as well as university-based mentors (professors in the faculty of education) to design their course of study and interest. In most cases, school districts provide teachers with the incentive of a pay increase for completing the program.

The TLITE model is an excellent example of a self-directed program where teachers explore and learn to use technology in their own time and ways, setting their own goals for use and application of their skills in their classrooms. It further makes use of both face-to-face and on-line instruction and support. TLITE graduates are often found at the centre of innovative technology practice in British Columbia schools.

A school-district model

Integrating Technology in the Curriculum using Inquiry (ITCI) is a workshop-based, school-district model. Teachers and principals from five schools in the Peel District School Board in Ontario were brought together in for a four day summer institute on technology in the classroom. It has been followed throughout the year by workshops, site visits, and on-line mentoring. The program culminates in a final presentation to all teachers of the work they have done with students over the year.

The ITCI model combines workshop and skills oriented professional development with teachers' own subject-related interests for using technology with their students. It provides support for teachers throughout the school year, both on-line and face-to-face.

Even more uniquely, it mentors and supports the school principals involved in the project as they attempt to more fully commit their staff to technology-use.

This district is considered a "leader" in technology integration. Its teachers and principals are committed to helping other teachers and principals integrating technology into learning in their classrooms and schools.

The School-based Model

One individual working within a school, with the support of a principal, can do much to aid his/her colleagues in their use of computers with their students. Jane Clayburn (name has been changed), a teacher at an elementary school in British Columbia has developed a system in her school whereby all teachers have access to professional development and support in their use of computers. She offers, for example, skills-based workshops before and after school and during lunch as teachers request it, and each time the school purchases new hardware or software. She also talks to teachers about how they can use computers for different aspects of the projects they are currently working on. She then helps teachers the first three or four times they use the computers for their projects, working with them side-by-side with their class. She is able to provide what she labels "just-in-time" support for teachers in her school more easily because her principal gives her two hours of "release time" from teaching per day.

This model works best when teachers and principals cooperate to take advantage of the expertise of one or more individuals. While not a "large-scale" model, we found it to be the single most effect model we examined as it provided ongoing support, on-site, and with flexibility. It depends entirely, however, on the good will of the actors, including a supporting principal.

Implications

As many districts and schools have discovered, professional development can be the Achilles heel of technology integration. Each of these models is described and critiqued in the paper in some detail. From the analysis, we have been able to describe key elements which should be considered when designing and implementing professional development programs for teachers. These include:

- The importance of self-motivation – a bottom-up approach to technology integration in the classroom;
- The importance of a facilitating environment – top-down support for innovation
- The importance of play and discovery;
- The importance of incentives, financial and time;
- flexibility which makes allowances for all levels of competency and interest;
- just-in-time support for teachers as they begin to use computers in their classrooms;
- ongoing support, both on-line and in person;
- on-site workshops, where teachers learn on the computers they will be using with their students;

- activity-based emphasis – teachers don't learn "stand alone" skills, but instead use computers in relation to the activities they design and will ask their student to do
- sustainability.

This list is not, of course, exhaustive but it is illustrative of those elements that teachers felt made their professional development experience with computers more successful.

Professional development for teachers cannot be ignored, nor can it be assumed that old models will work with new systems and technologies. In fact, some of the very characteristics of new technologies of computing and communication that make them so effective and challenging to use in the classroom also pose challenges and opportunities for teachers and their professional development. Our study provides some initial indications of best practice in the area, emphasizing the importance of sustainability, and reveals pitfalls to be avoided.

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A Framework for Designing Professional Development Courses in Instructional Technology for Teachers

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Abstract: How do faculty in colleges of education gear their instruction in Instructional Technology courses to accommodate the varying levels of knowledge, skills, and abilities of practicing teachers? This presentation provides a framework for designing professional development courses in IT to meet the needs of individual practioners. Key features of the course development model include: assessing the entry level of participants, based on ISTE standards and their levels of proficiency in using technology; determining the availability of technology and support for using technology in participants' schools; and the development of individualized learning plans that are aligned with ISTE standards and based on principles of effective professional development. The intent of the presentation is to stimulate dialogue on designing and delivering effective graduate level coursework in IT to practicing teachers.

Many colleges of education (SCDEs) are currently offering, or are planning to expand their graduate courses for teachers on integrating technology into their teaching. A preliminary examination of Instructional Technology (IT) courses in U. S. colleges of education suggests little agreement on a conceptual framework for designing graduate level coursework for teachers. Perhaps the International Society for Technology in Education Standards for Teachers (ISTE, 2000) will begin to exert more of an impact nationally; but, currently their influence is not yet reflected in coursework to any appreciable extent.

As faculty in SCDEs begin to develop new courses and revise existing ones to align with the ISTE standards, they are confronted with a variety of challenges. Individual teachers differ with respect to their knowledge and skills in using technology. Some teachers are more adept than others, or have had more experience than their colleagues in integrating technology into their classrooms. The settings in which teachers practice differ with respect to the accessibility and availability of technology. Some schools have new computer equipment, whereas others are using outmoded hardware, or have very few computers per classroom. Administrative and technical assistance to facilitate teachers' use of technology also vary among schools, ranging from excellent in some schools to little or no support in other locales (National Center for Education Statistics, 2000) . Course designers must consider these differences among teachers as well as differences related to technological readiness and availability among participants' schools in planning appropriate graduate level coursework for teachers. In addition, given the public's expectations for teachers to become proficient in using technology, emphasis must be placed on designing coursework to assist them in achieving the desired outcomes.

This presentation provides a framework for designing IT courses for practicing teachers. The following key features guide course development. First, data from national studies such as the National Center for Education Statistics (NCES, 2000) are used to describe the varying levels of knowledge and skills teachers possess with respect to technology and differing degrees of availability to technology that characterize our nation's schools. These data illustrate the range of abilities and setting characteristics SCDE faculty must consider in order to meet the needs of individual teachers enrolled in IT professional development courses. Second, the ISTE Standards for Teachers are used as the basis for developing course objectives. Third, course content reflects the literature on stages of proficiency in using technology from novice to expert practioner (Mandinach, 1992; Sandholtz, Ringstaff & Dwyer, 1997). Fourth, differences in availability and support for using technology within participants' schools is used as an impetus for planning ways to overcome barriers to implementing technology. Fifth, the literature on developing rigorous and professionally challenging graduate level coursework for practicing teachers (Little, 1999; WestEd, 2000) that actively engage participants in their own learning is an integral part of the course design. Finally, opportunities for college faculty to conduct research related to incorporating technology into teaching as well as encouraging practioners to become reflective practioners who study their own practice are discussed.

The presentation is best conceived of as a Rubik's cube, a puzzle of sorts, that is multifaceted and seeks to involve participants in examining the factors that are inherent in developing appropriate IT professional development courses for teachers. As faculty in colleges of education, we must be prepared to practice what we preach by modeling the use of technology in our own teaching and individualizing instruction to the maximum possible extent. This presentation seeks to make that point and stimulate discussion on the development and design of graduate level coursework for practicing teachers on instructional technology.

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A Professional Development Model for the Use and Integration of Technology

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Abstract: This paper outlines the preliminary results of a study that involved creating a professional development model for the use and integration of technology in an elementary school in Nanaimo, British Columbia, Canada. The 13 teachers and one support staff voluntarily attended professional development workshops on topics chosen based on pre-chosen professional growth outlines and specific action plans. The salient finding were threefold: (1) it is imperative that the participants feel in control of their own development; (2) there are specific motivators and inhibitors for the implementation of the action plan; (3) the respondents need to have a community of learners.

Introduction

Convincing teachers to use technology is not a difficult task; getting teachers to use technology is an extremely difficult task. The preceding statement has become the mantra of the research project outlined in the following pages as the writer found it very easy to discuss the advantages of using technology---specifically computers---in and out of the classroom. In other words, the teachers in this study, by and large did not need convincing to know that they could use Powerpoint presentations as an alternative to oral presentations, that the digital camera could open up possibilities that were endless, that transferring information to the school webpage could send out simple information to a potential audience of millions, as key examples. What they had, and some continue to have, a problem doing was actually getting around to using the technology. This writer believes that we have begun a journey that will allow the teachers to meld these two beliefs; philosophy will become fact.

The Study

In October, 1999, the writer and the grade five teacher at the elementary school, attempted to introduce the staff to a model of technology integration that he and the grade five teacher had designed. The research interest was to investigate the influences of technology on writing achievement. That is, do children write "better" when they are introduced to technological tools such as word processing (e.g., cutting and pasting; graphic importing), digital cameras, Powerpoint, and webquests? The project did not succeed. After a few debriefing sessions with individual staff members, the researcher realized that the project did not succeed primarily because it was moved too fast with a staff that was involved with so many other projects. More importantly, the answer lay in the issue of ownership; the teachers needed to choose what they wanted to learn, how much they wanted to learn, and when they wanted to learn. It is clear that most staffs would also need to have this type of ownership in order to implement technology in the classroom. From these revelations came this project and the Continuum of Technological Literacy (see Fig. 1).

The continuum that was designed for this project was adapted from the literacy (i.e., reading and writing) research from the last 10 to 15 years. Indeed, technological literacy is not any different than reading or writing literacy; however, the writer has not come across any researchers who have designed such a graphic representation. Subsequent to designing the continuum, the researcher has found a similar study (CEO Forum, 1998; 1999; 2000) on a much larger scale. As this study progresses, it may become more appropriate to adopt the CEO Forum (1998; 1999; 2000) descriptors: entry, adoption, adaptation, appropriation, and invention; however, the strength of this continuum and the descriptors laid in the key questions that teachers ask themselves as they progress along the continuum.

According to the Continuum of Technological Literacy, the participant might ask one of five questions depending where he or she begins. The first question, at the beginning of the continuum or the **pre-literate** stage, asked whether or not technology could help the person. In answering this question, the respondent is forming a habit of mind that assists him or her to move along the continuum. The second question asked what the effective tools would be for particular tasks or goals. The person would be at the **emerging** stage at this point. The third question queried, at the **developing** stage, when the participant could optimize learning so that he or she examines the conditions in the classroom, the attitude of the students, and the aforementioned tools. The fourth question, when the person is at the **competent**, stage, asked how to use strategies effectively. The last, at the end of the continuum and the **literate** stage, questioned why the person is using technology strategies, in general and, in particular.

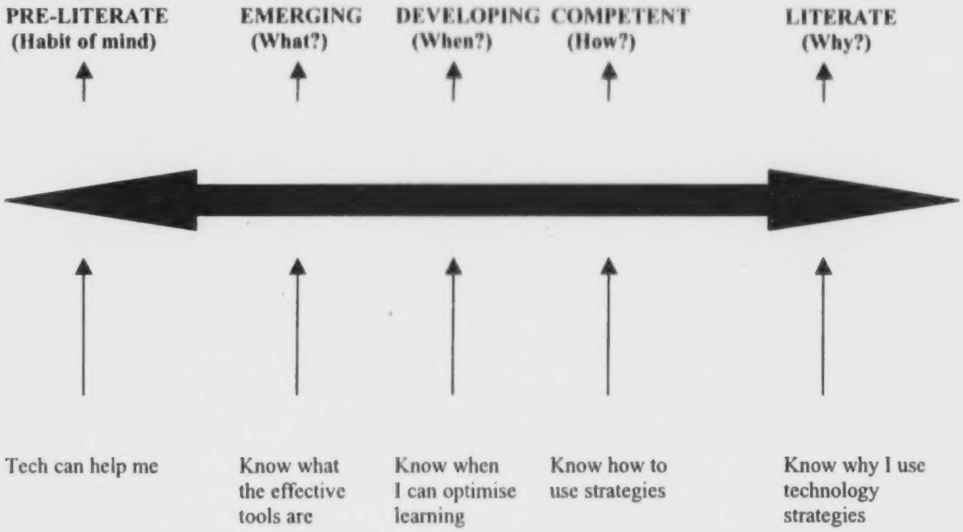
PRE-LITERATE
(Habit of mind)
EMERGING
(What?)
DEVELOPING
(When?)
COMPETENT
(How?)
LITERATE
(Why?)
Tech can help me
Know what the effective tools are
Know when I can optimise learning
Know how to use strategies
Know why I use technology strategies

Figure 1: The Continuum of Technological Literacy that all participants will use to map their journey.

Critical to this study is the fact that the site school is a recipient of a Network of Innovative Schools (NIS) grant and was the first elementary school in the province of British Columbia to receive the prestigious recognition from the Canadian government. As the school was so open to technological innovation, in June of this year, the researcher circulated a personal growth plan questionnaire that had been created in consultation with the principal and two staff members. All teaching staff, including three new teachers, and one support staff member completed the questionnaire. The results of the Likert-scale questionnaire were collated and a meeting with the principal was set up to discuss these results before presenting it to the staff. When the overall results were presented to the staff, each of the fifteen participants completed an action plan that outlined on what he or she would like to receive professional development, who would be involved in the delivery of the Professional Development, when it would start and end, and how would "success" be measured. Respecting the fact that many of the teachers in this school have been recognized, at various levels and by various organizations, for their outstanding contributions to the education of students, the researcher asked them to outline what they felt would be roadblocks and easy access, to use a highway metaphor, for the success of their action plans.

In conjunction with these action plans, the Continuum of Technological Literacy was presented to the staff as an artifact on which they could measure their personal growth. That is, much like when students learn to read and write, teachers started at a particular point of this continuum and as they reached each "stage" on the continuum, they asked themselves questions about what was happening at that point in their movement along the continuum. In short, a teacher might have moved from being "pre-literate" (Can technology really help me?) to the end of the continuum and be "literate" (Why do I use the technology that I am using?). It should be noted that the continuum is recursive in that teachers may need to move back to a previous stage or stages in order to understand a particular concept or technological tool and that some teachers may have to begin at the first stage for some concepts or tools but may begin at the last stage for other concepts and tools. It also acknowledged that some teachers may choose to master only one computer software or hardware concept or tool in the course of one year; however, by encouraging teachers to "take it slowly" and by providing support when needed, the personal growth (action) plans will be sure to be completed.

Approximately half of the participants (n = 8) attended the initial Professional Development workshop on how to use a digital camera and how to import those files into word processing (e.g., Word) and multimedia presentation (e.g., Powerpoint) programs. After this workshop, each of the participants were given a questionnaire that pinpointed the pros and contras of that particular workshop as well as general information that would assist in further workshops. The key questions asked on the questionnaire revolved around three areas: (1) the utility of the workshop (i.e., on a scale of 1 to 5, what the usefulness, for the success of the individual personal action plan was); (2) the next layer for the scaffolding (i.e., what is needed now that the participant has this new knowledge); (3) the sense of community (i.e., has there been an opportunity to discuss the information with a colleague or to implement in the classroom).

At the time of writing, three to five more workshops will be conducted. Questionnaires will be conducted at the conclusion of each workshop. In addition, a short interview will be conducted with randomly selected participants in January and March of 2001.

The Findings

The findings to date are minimal in data but plentiful in trends and patterns to come. Even at this early stage of data analysis, it is apparent that three salient findings are evident. Firstly, it is critical that the teachers and support staff have a sense of autonomy. Secondly, there exist a number of characteristics that promote or motivate success as well as characteristics that inhibit or prohibit success. Lastly, the participants need to belong to a community of learners.

The researcher has noted that the participants in this study need to know that they, themselves, are in control of, and responsible for, their learning and movement along the Continuum of Technology Literacy. These particular teachers and the support staff member are exceptional in many fields within and without the school community and it would be insulting and detrimental to the success of their development and of the research study to treat them otherwise. They know what are their timelines for completion, they know what they want to know, and they know what they want to use in the classroom. As common sensical as the preliminary finding is, it appears to be critical that each teacher knows that he or she has direct "ownership" of his or her learning and professional development.

In the informal discussions with teachers before and during the study and gleaned from the literature (see CEO Forum, 1999 "Principles for successful technology professional development," pp. 17-21 and U.S. Department of Education: NCES, 2000, pp. 89-100), the researcher generated a list of "motivators" and "inhibitors" for the successful completion of individual professional development action plans (see Tab. 1). In other words, if a school district, particular school, or individual teacher wanted to know what conditions needed to be present for successful professional development, this inexhaustive list would be a place to begin. This paper is too brief to expand on each list item but two motivators will be discussed in the next paragraph; two inhibitors are worth mentioning at this point in the paper: "cliques of learners" and "locomotive staff member." The former inhibitor is an integral component for the success or failure of professional development in technological literacy. If a group of learners get together with each other in the school and share their knowledge, there is direct benefit for the school (as will be discussed in the following paragraph); however, if that group only seeks to keep its learning and knowledge within the group, those learners become a clique and, by definition, a clique, rather than a community, of learners. The latter inhibitors, "locomotive staff member," refers to the person in the school who does know a great deal about technology and believes that everyone in the school should also be at this philosophical and/or technical level of expertise. This person shows others how to use technology by doing rather than by teaching; he or she might demonstrate the construction of a webpage by creating the page in front of his or her colleague without allowing that learner to attempt the task from a participant rather than observer point of view. It should be noted, on the other hand, that this person is rarely acting in the capacity of "computer coordinator" who would be beneficial to a staff (Becker, 1998). At his or her worst, the "locomotive" also sees him- or herself as superior to those who cannot or choose not to be at his or her level.

The last preliminary finding, and a corollary to the preceding trend, is the notion that the professional development participants must belong to a community of learners. A community of learners is a group of like-minded individuals who believe that their learning goes beyond the group and should be shared by others outside of the group. It is also dynamic so that, unlike the "clique of learners," the composition of the learners changes from topic to topic. The researcher has witnessed several instances of this community of learners at work. Particular teachers have spent time attending a workshop, practicing the newly-acquired skills independently or with others and then teaching those teachers who did not or could not attend a specific workshop. At the core of the community of learners is the idea that these participants are teachers and the concept allows them to do what they are best at: teaching. The idea of community of learners will be an interesting one when the data---especially the interview data---begin to come in later in the study.

Motivators	Inhibitors
• Direct administrative support	• Little or no administrative support
• Indirect administrative support	• Little valuing from district
• Support network within school	• Token assistance from federation or ministry
• Support network outside school	• Cliques of learners
• District support	• One or two key players
• Federation support	• Close proximity of experts
• Ministry support	• Sporadic funding
• Key pods of learners	• Disorganized spending
• In- and out-house facilitator	• Bandwagon/Missionary zeal
• "Peer tutoring"	• Locomotive staff member
• Collaboration	• Excluding support staff
• Distancing of experts	• Blind faith
• Including support staff	• Moveable anchor
• Specific Professional Development	• No limits to your own time and effort
• Earmarked funding	• Misallocation of time
• Targetted spending	• Working alone
• Experimentation	

Table 1: Motivators and Inhibitors for the Success of Personal Growth Plans

Conclusions

This paper has outlined a small-scale study of 13 teachers and one staff member who volunteered to participate so that they could learn more about the use and integration of technology. The school is innovative in its use of technology but the number of teachers who use technology in the class is low. In fact, the principal of the school completed the STaR and the school was "mid tech" in hardware, connectivity, and content; however, in professional development and integration and use, it was "low tech." In other words, there are few hardware barriers in the school but the level of expertise and confidence is low. This study has helped the participants to understand that the opportunity for the use and integration of technology is present but they, themselves, need to take the next step to achieve success.

The three preliminary trends of the need for autonomy, the identification of motivators and inhibitors, and the notion of a community of learners will be interesting and informative to follow as the study progresses over the next stage. This researcher hypothesizes that the participants will move along the Continuum of Technological Literacy and will feel empowered to continue that journey until each teacher has reached his or her comfort zone for that set period of time. It is also apparent that the teachers will need more than one year to unanimously agree that they are a "high tech" school. Time will tell.

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An In-Service Methodology Course via the Internet: A Designer's Perspective on the Learning Potential of the Delivery System

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Abstract: This presentation describes a model of an in-service Methodology course for teachers through the Internet which not only aims at teaching a content area but also represents a model of instruction. While focusing on the content of the course, the participants are exposed to a delivery system which includes features they can easily adapt to their own teaching environment; while expanding their personal horizons regarding the use and potential of the technology. Knowing how to transfer pedagogical skills and strategies from one context to another is essential to help teachers solve problems and reach students more effectively. We intend our training programme to serve as a model of teaching which the participants may transfer to their own teaching contexts. The design of the course is based on a Presentation, Practice and Production (PPP) model.

We are in a period when strong efforts are being made to develop a new kind of professional community in education - one whose ethos is built around the continuous study and improvement of teaching and learning, and the direct application of knowledge to real life situations. Educators are attempting to design environments conducive to the construction of knowledge which have relevance to learners' authentic needs.

In such a constructivist view of education, we aim at developing a learning environment which facilitates the enquiry of learners but also emphasizes the practical implications for production, both in the immediate setting and in the long term. Within the general framework of constuctivism, knowledge is emerging rather than static, learning means seeking meaning within one's expanding frame of reference, building knowledge and checking it against the concepts of others, and connecting what is being learned in the instructional setting with real life demands (Richardson, 1997).

The theoretical underpinnings for such a view are that new concepts can change ways of organizing knowledge, provide new material for associations and problem-solving (Ellis, 1993), and that meaningful learning is likely to go beyond the classroom and provide skills and strategies that will impact future actions. A further underlying assumption is that the design of a useful instructional model must incorporate a computer environment of some kind, since we strongly believe in the increasing importance of computer literacy for functioning in the real world. Indeed, one of the ways of bridging the gap between the instructional environment and life outside the classroom is learning and knowing how to function with the technology.

Rationale: The rationale behind the design of this Open University in-service methodology course for teachers of English as a foreign language is based on the construction of teachers' knowledge, an awareness of the importance of a teaching paradigm that models teaching and learning, and the development of the capacity to face the real world both within and outside of the instructional setting. We have created a course based on a task-based syllabus (Long & Crookes, 1992). which is teacher-directed in its conception but highly learned-centered in its actualization (White & Weight, 2000).

A salient feature of teaching is that it requires continuous adaptation and demands new learning in order to solve the problems of each moment and situation. Therefore the process of knowing how to transfer pedagogical skills and strategies from one context to another is essential to help teachers solve problems and reach their students more effectively. Horizontal transfer refers to the conditions in which a skill can be shifted directly from the training situation. When the work and training settings are very similar, a skill can usually be transferred "as is" with little additional alteration and learning. On the other hand, if the two contexts are very different, vertical transfer is needed. Vertical transfer refers to conditions in which the new skill cannot be used unless it is adapted to fit the new conditions wherein an extension of learning is required before the skill can be applied. Such transfer is more likely when there is a greater gap between the context of training and the conditions of the new situation: the newly learned skill being different and thus not easily fitting into the new situation. The distinction between horizontal and vertical transfer refers to the amount of adaptation and reinterpretation that is necessary if the skill is to be effective in the new situation. Familiarity is the key. The greater the degree to which a new skill fits into already familiar patterns, the less adjustment will be needed.

Because English is the subject that our experienced teacher trainees teach, we have been able to take advantage of the globalization of English and the fact that it has become the main medium for international communication and technology. English provides us with a window to the real world as well as with additional opportunities for accessing information. As a result, we have created a framework which links pedagogical perspectives on teaching and learning to elements of Internet input in order to achieve our particular desired educational outcomes.

Design of the Course: The 15-week course is transmitted via the Internet. It consists of weekly readings from selected professional journals provided to the teachers in a printed anthology, and of questions related to these readings delivered through the Internet. Some of the questions focus on the theoretical principles discussed in the articles while others are application tasks which the trainees are required to think about, plan and implement in their own teaching context. The trainees' reflections and reports about the practical tasks, the presentation of individual and of collaborative projects among participants, the discussions, as well as all other interactions are asynchronous and occur on-line. Depending on the nature and the purpose of the communications, some involve the trainees only while others include the trainees and the instructor.

The participants are responsible for finding and sharing Internet sites and articles which are topically related to the subject matter at hand and which they feel will enhance their knowledge and increase their teaching repertoire. In addition, three areas which may be problematic for teachers are selected on the basis of negotiation with the trainees. Each chosen area serves as a topic for on-line discussions for a period of four weeks, with the specific aim of finding appropriate solutions that will emerge from sharing ideas and drawing applicable conclusions. At the end of the course, trainees submit an individual portfolio which includes some of the above and a journal in which they are asked to reflect on their experience of the course and its practical relevance to their teaching context.

The design of the course is based on a Presentation, Practice and Production (PPP) model (Willis, 1996). Planning the presentation of the content, getting the participants to practice and execute the required tasks, and eventually take what has been learned beyond the framework of the immediate environment into a wider world seems to reflect a sensible definition of an educational mission. In other words, we take the view that one of the secrets of successful learning lies in the process of transfer – the effect of learning one topic or skill on another situation.

In this context, the teacher trainer presents the course content, encourages the teacher trainees to practice what is being learned within the framework of the course, and hopes that eventually some of the elements of the course, including the strategies and skills presented, will be utilized (in horizontal transfer) adapted and perhaps even reproduced (in vertical transfer) by the trainee in his/her professional world (as a teacher) and personal world (as an Internet user).

Similarly, the teacher prepares and presents materials in class, encourages the pupils to practice what is being learned in the school, and hopes that in the future some features of what has been taught and learned will be useful in the pupils' lives outside the classroom. The presentation and practice stages feature mostly in the school setting while the production stage is expected to first occur in the instructional environment, and eventually filter through beyond that environment into the pupil's big wide-world. In other words, pupils will operate first on the basis of horizontal transfer and then proceed to a vertical transfer of the skills and knowledge they have acquired.

How is this model of teacher training for a Methodology course for teachers different from others? The method of delivery via Internet not only teaches a content area – Methodology for teaching English as a foreign language – but it also represents a model of instruction for their own use in their classrooms. While focusing on the content of the course, the participants are exposed to a delivery system which consists of features they can easily adapt to their own teaching environment; at the same time they are expanding their personal horizons regarding the use and potential of the technology.

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Teacher Reflections on Learning New Technologies

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Abstract

An experimental course offered at The George Washington University (GWU) is specifically designed to assist teachers in meeting the technology standards and performance indicators developed by the International Society for Technology in Education (ISTE, 2000). Eleven teachers representing three school systems participated in the first offering of the course in Fall 2000. Teacher reflection through journal writing focused on how teachers perceived themselves as learners of technology and the ways they were able to transfer those perceptions and new understandings to their instruction of secondary students. Several common themes emerged relative to learning and using technology to enhance student learning.

Introduction

The formulation of National Education Technology Standards for Teachers or NETS (ISTE, 2000) reflects what many participating national education affiliated associations (i.e. National Education Association, American Federation of Teachers, National Association of Secondary School Principals, Council of Chief State School Officers) as well as corporate (Apple, Milken Exchange on Education Technology, Microsoft Corporation) and government (U.S. Department of Education, National Aeronautics and Space Administration) organizations believe is an urgent need to elevate the technology proficiency of PK-12 teachers. Added to the list of other national, state, and local standards created for students and teachers in all curriculum areas across all grade levels the standards movement is propagating at a dizzying rate. At the center of it all is the classroom teacher who must assume considerable responsibility for implementing standards to improve students' learning.

How do teachers meet the multiple demands of standards? In the case of technology, the options for learning can be limited when schools are underserved or when the folks with the "know how", the technology specialists, are forced to spend their time connecting wires and trouble-shooting. At GWU, we offered an experimental course to assist area teachers in learning about and learning to use new technologies for instructional purposes. The course was tailored to assist teachers in meeting the performance indicators outlined in NETS. Six standards encompass what teachers should know about and be able to do relative to technology. In brief, they are: understanding technology operations and concepts; using technology to design effective learning environments; applying technology to maximize student learning; effectively using technology to facilitate assessment and evaluation strategies; enhancing productivity and professional practice with technology; and, understanding social, ethical, legal, and human issues surrounding technology (ISTE, 2000).

In the course, computer technology was the primary medium. Learning experiences ranged from simple to complex. Teachers learned to create newsletters, develop presentations using MS PowerPoint, evaluate and use various software, explore and evaluate Internet resources, critique listservs, complete a scavenger hunt to in order to uncover the technology resources available to them in their schools and school systems, design webquests, and develop a website to showcase their technology portfolios. As teachers encountered new content, they were encouraged to consider how they learned, what strategies were most useful for them, and what, if anything, made learning technology unique. Reflections were captured through journal writing.

Promoting Reflection Through Journal Writing

John Dewey (1933) believed that there are three primary sources for student knowledge: beliefs based on emotions, beliefs based on authority, and reflective thinking. He believed that reflective thinking involves active, persistent, and careful consideration of any belief or practice in light of its supporting evidence and its eventual consequences. Dewey implied that both content and process are components in reflective thinking. Han (1995) distinguishes between the two: "While the process element of reflection emphasizes how teachers make decisions, content stresses the substance that drives the thinking" (p 228).

Reflective teachers think about their behaviors and experiences in the context of the educational environments in which they work. They then make work related decisions that are more informed. While reflection is a source of personal and professional development essential to effective teaching, it's often a difficult process for teachers. Two reasons for this difficulty are: 1) lack of time and structured opportunities for reflection and, 2) teachers' inability to view their school based experiences objectively and thereby benefit from them (Black, Sileo &Prater, 2000).

One method for promoting reflective thinking is journal writing since it engages the writer "... in making beliefs and knowledge explicit and provides an internal dialogue between feelings and thoughts" (Han, 1995, p 229). Simply requiring that they respond in writing to experiences in the course and their classrooms, does not guarantee that teachers' professional development will be enhanced, or that changes in professional practice will occur. My experience has taught me that reflective writing is most useful for the writer and for me as instructor when it has an organizing structure. This structure can take the form of specific questions that the writer responds to, a descriptive or expository writing that the writer critiques, or a step-by-step process in which the writer describes an event, then reacts and analyzes the event in order to determine a course of action.

In the GWU course, three central questions prompted teachers to reflect on both content and process. The table below describes the structure of their journal writing.

React	*What thoughts, responses, perceptions, and/or attitudes were generated as you learned and used technology presented in the previous class?*
Extend	*In what ways can you use this technology to promote students' learning and/or enhance your instruction?*
Transfer	*Given your experiences as a learner in the previous class, what have you learned about teaching technology to your students?*

Table 1: Organizing Structure for Journal Writing

Eleven teachers submitted thirteen journal entries representing continuous reflections on their experiences during class and between classes. Between classes experiences were those that teachers had while practicing and applying what they'd learned in class. These included developing new lessons or revising existing lessons to include a technology component, creating a technology-based assessment or using technology to manage teacher work. Continuous reflection refers to the expectation that teachers would cycle through previous entries before writing so that they could reinterpret and articulate their understandings and beliefs in light of new experiences and knowledge. A description of the course design provides a context for understanding the text of the journal entries.

Course Design

Class sessions were generally divided into three main segments. The initial time was spent reviewing what was learned in the previous class then introducing new or less familiar material, equipment, and skills. This was followed by guided practice and finally lab time to begin applying new learning in an activity linked to a course assignment. Assignments in the course were designed for use in teachers' classrooms and allowed for individualization based on interests and needs. Skills and knowledge required to successfully complete the initial assignments were folded into successive assignments.

Research Questions

The purpose of this study was to describe professional growth evidenced in the journal writing of eleven teachers participating in a course on technology applications in educational settings. I was particularly interested in identifying common themes that emerged from the entries. Three questions guided this investigation: Do reflective journals demonstrate heightened awareness of technology standards and applications? Do reflective journals validate that course assignments linked to classroom practice actually lead to transfer of new knowledge and skills to secondary students? Do reflective journals aid teachers in identifying the conditions necessary for effective classroom implementation based on their own experiences as learners?

Data Analysis

A total of 143 journal entries were analyzed in a multi-step approach described by Huberman and Miles (1994). Using the organizing structure for the journals as a framework for initial analysis, the entries were sorted into three categories: react, extend, and transfer. A second step in the analysis involved selecting entries from each category that demonstrated reflective thinking in three cluster areas: awareness, transfer, and teaching. The data set was reduced to 104, and analyzed to determine themes common in each of the cluster areas. Excerpts from the journals represent a partial sample of quotes.

Findings

Heightened Awareness

Of the eleven teachers participating in the course all had experience with word processing and communicating using e-mail. None of the students had used a word processing program to create a newsletter, 3 had some experience with presentation software, all had attempted Internet searches at some level, none had any prior knowledge of webquests and none had ever developed an electronic portfolio or published a website. The range in technology related knowledge, skills, and experiences among the group was extensive. One teacher had used a computer for the first time only six months before the course began, others varied in their abilities based on the technology and only one teacher had advanced skills in communication and productivity applications. Evidence of heightened awareness was found in at least three journal entries for all teachers. Themes that emerged are awareness expressed as excitement, as anxiety, as recognition, and as realization.

Excitement

Most of the narratives expressing excitement refer to responses to technology tools or applications introduced in class, to instructional uses for familiar technologies, or to students' responses when the teacher implemented technology use in his/her middle or high school classroom.

> I feel like a student again. I find myself discussing what I have learned in this class with my students. I ask how many would be interested in learning how to do some of the things we do. Even the young man who yearns to be out of my class wants to be a part of a computerized classroom.
>
> A webquest works by taking a group of learners on an inquiry-based exploration of real-world facts and ideas that result in a collaboratively-mediated authentic learning experience. Eureka! Who could ask for anything more?

Anxiety

Increased awareness doesn't always produce pleasant thoughts and feelings. Sometimes, tension results when one initially become aware of something that has direct implications for her or him. This was the case for many of the teachers in this course as they learned about new technology standards for teachers and as they were introduced to some of the course material and expectations. As teachers added to their knowledge and skills feelings of anxiety were reduced or eliminated.

> My head is starting to reel from the wide array of technologies that can be used by teachers. All of these tools and resources are to be used in a way that complies with technology standards, which are tossed on the pile to complement the content and pedagogy standards that are also to be complied with. I wonder when I will find time to actually teach!
>
> In the last session we were introduced to creating a web page. The guest speaker…was very knowledgeable. She did a remarkable job on her own web site. I felt somewhat overwhelmed as I listened to her presentation. [The speaker's] website seemed to be so much more than what I felt I could accomplish.
>
> I feel very much like my students must – overwhelmed and anxious. Sometimes I count the sessions until the end of the course. Other times I cannot wait to get to class.

Recognition

Several of the teachers expressed heightened awareness as recognition of their abilities and predispositions as learners.

> To confess, I was a victim of my own creative process. I like to re-do things, exploring the alternatives, trying to take it a notch higher. I took this one a notch too far, though, and ran out of stick! The first effort was simple but it had a nice effect to it. As the days and nights passed, I reworked the newsletter so much that on the way to creating The Best Thing I Could Do, I nearly snuffed out all the original spark.
>
> My week was spent thinking about my electronic portfolio. I feel like I have so much to do that I don't want to start anywhere. I can tend to be a perfectionist and that is why it takes me so long to get started.
>
> As for technology, I think that my use of technology fits with my personality type as well. A person can communicate, create and organize on the computer with out ever directly talking with another soul.

Realization

As teachers' awareness of technology applications in classrooms expanded, they all wrote about experiences or thoughts that I characterize as being "Ah-hahs". By that, I mean they came to realizations about broader issues related to technology than they had written about previously.

> We must be selective in our use of technology tools in our classrooms. As educators, we must always have the primary goal of effective learning and cannot become so impressed with what technology can produce. We must always consider different strategies and be sure to use the best one to do our primary job, which is teaching.
>
> I just wonder how much input the students have in the planning, process[ing], and implementation of technology. It bothers me that we seem to be "doing technology" to the students. Most of the decision-making power resides at the top of the pyramid…and the students are down there at the base.

Transfer

An important indicator of professional growth is the transfer of knowledge and skills gained in the course to other experiences or environments. In this case, my concern was whether the reflective journals validated that course assignments linked to classroom practice actually lead to transfer of new knowledge and skills to secondary students. Three themes surfaced in the analysis as critical influences in transferring knowledge and skills: overcoming barriers, managing time and gaining confidence.

Overcoming Barriers

As teachers explored the opportunities to introduce the computer-based skills they'd acquired to their students many frequently encountered barriers to technology use in their school sites. Their reflective writing describes their frustration, but also highlights their creativity, persistence, and success.

> When I think about my school and my class, I'm not very excited about integrating technology. I feel like there is so little access to computers for our students. Because of this course, I've spoken with our principal and will be getting a computer in my classroom soon which will allow me to implement some of the projects I've mentioned in my journals.
>
> Our technology coordinator told me that I would not be getting a new computer. I was livid …but, sometimes bad news makes you work a little harder. Since our discussion, I have secured two more computers with Internet capabilities. This brings me to a grand total of six. I am currently designing in-class fieldtrips using computer technology. My students are responsible for producing a newsletter and will help maintain a course-related website. This course has turned a flame to my classroom operation.

Managing Time

One of the issues that teachers raised regarding technology use was time. If using technology saved them time, they were wholeheartedly in favor of it. If it required more time than some other approach, they were less inclined to use technology.

> Creating newsletters to communicate with students and/or parents is a perfect example of how classroom practices can be improved by a very simple application of technology. A common complaint of teachers as well as other professionals is that new technology consumes rather than saves time. This is an example of the opposite being true.
>
> [The presentation on searching the Internet] made me realize I was not using the information I learned about searching the web and how much time I could save by simply implementing some of the research tools I had previously learned. I want my students to be equipped with the necessary knowledge that will make searching the web a good experience rather than a burden.

Gaining Confidence

In order to transfer skills and knowledge to their students, teachers needed to feel confident in their ability to both use and teach a particular technology.

> It is not enough to have teachers "technology certified" on paper. Teachers need to be given the confidence in order to get them to want to implement the technology in their classrooms. I had never truly used PowerPoint as it's designed to be used before last week. As it is, I used it effectively twice in one week.
>
> This weekend I have been going back and forth between hating this course (it entails so much work!) and loving it (I have learned how to use more technology in this course than I have in the last ten years!). Despite my frustration, I am confident the webquest I developed is one my students can really use and learn from.

Teaching Technology

Reflective writing encouraged teachers to identify the conditions necessary for effective classroom implementation based on their own experiences as learners. Empathy and effective teaching are two themes that captured what teachers had learned.

Empathy

As teachers encountered challenges in learning to use technology some made references to having a new appreciation for how their students must feel in similar situations.

> I feel like I'm all alone! I am sympathizing with my students BIG TIME. While I am usually not afraid to ask if I have a question, many students are; they may frequently feel as I do: LOST.
>
> As I reflect on my feelings toward creating my website, I can relate to some of the grumbling my students do when asked to do certain projects. I need to help them get started and express their thinking. I need to be there to help them move forward rather than see their reservations as a refusal to participate.
>
> My experiences have also informed me in terms of using and teaching technology with my students. Just like I did, students need the proper equipment, time to investigate the web, and time to struggle with the software.

Effective Teaching

Teachers identified clear instructions, planning, organization, sufficient time, pacing, instructor patience and support, and differentiated instruction as key elements of what they'd learned about teaching technology while sitting in the "student seat".

> Technology based instruction needs to be carefully planned out in advance. This is no different than instruction that does not utilize technology. As teachers, we must always carefully map out activities, noting potential pitfalls and be prepared for potential detours.
>
> A good practice for my classes is to have them do a brainstorming activity before getting started on their projects. The brainstorming will give the students time to think through and work cooperatively to come up with ideas. I do a lot of brainstorming but I'm not good about writing them down.

Discussion

Reflection was an essential aspect of teachers' professional growth. This study found that reflective journals allowed teachers the opportunity to (a) become more aware of what and how they were learning and make connections to broader educational issues, (b) transfer what they had learned to secondary classrooms, and (c) examine how their experiences as learners revealed conditions necessary for effective technology implementation. The organizing structure of the journals helped to focus writers' thinking. Revisiting earlier entries as the first step in writing each new entry pushed teachers to reconsider their feelings and thoughts in the context of newly acquired skills and knowledge. Reflection assisted teachers in making informed decisions about their classroom practices.

It was not surprising to find that teachers often cycled between feelings of excitement, frustration, acceptance, and satisfaction as they encountered new technologies since much of what must be learned required "doing". The movement from seeing the possibilities to creating a usable product fit within Einstein's description of genius as one that primarily requires perspiration and a modicum of inspiration. Learning technology requires practice, practice, and more practice. Many of the problems teachers encountered (a sudden error message, or a frozen screen) aren't solved by referring to written text and don't usually lend themselves to easy solutions. A heightened sensitivity to their students' feelings resulted from teachers' encounters with challenging situations.

Further study on effective strategies for teacher infusion of technology in schools with highly defined content standards is needed. Since, for all teachers in this study, transferring skills and knowledge to their students required they spend class time teaching technology rather than math or English content, teachers were selective about when and how much technology they integrated in their classes

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Puzzling Over the Missing Pieces:
The Real Practice of Technology Integration

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Abstract: This paper is a report on the findings of a pilot study conducted on novice technology-using teachers. Although emerging technologies have significantly impacted much of society, they have not yet and to any large degree, transformed the practice of many educators in the classroom. Findings indicate that several strategies may assist these teachers in learning to use technology. Provide them with a logically sequenced curriculum guide that identifies specific computer objectives and methods of including these in content areas. Encourage administrators to establish concrete guidelines to promote teachers' regular planning and practice of technology integration.

Introduction

Recently emerging technologies are presenting dynamic instructional opportunities for educators such as they have never before experienced. Through the use of these technologies, some teachers are providing students with powerful classroom experiences that will significantly enhance learning. These teachers, who are still few in number, have eagerly welcomed the opportunities technology offers and are moving forward in acceptance of these new learning resources. On the other hand, a large number of computers still sit in the back of classrooms collecting dust or on a teacher's desk being used only for classroom bookkeeping. Teachers in these classrooms have experienced enormous uncertainty and anxiety at the restructuring they foresee as a result of technological reform. Use of technology has yet to make a significant impact on the way they teach or in the way their students learn (Parr, 1999). Roblyer (2000) reminds us that the mere presence of technology will not guarantee its use (p. 29). In either case, teachers are keenly aware of an inescapable fact–technology has made its impact on society and if they are to effectively prepare students for tomorrow's world, they will have to adjust their thinking and their methods of teaching to incorporate its use.

Society has been experiencing this technological transformation for some years now but only, due in part to increased funding and connectivity, has the field of education begun its transformation at the same rapid pace. Trying to find ways to prepare our educational institutions and personnel to make the needed changes can be likened to putting together the pieces of a puzzle. When putting together a puzzle, the framework is usually connected first, consequently making it easier to assemble the inside of the puzzle. The rest of the puzzle is arranged until the last piece completes the picture. Throughout the process the box cover provides the picture, or illustration of the final goal. Herein lies part of the problem with technology integration–no one knows what the final picture of this reform will include. It is easy to fit the outer edges together because each of these pieces can be identified by at least one straight side. The framework for integration has been identified and many of these outer pieces have provided a preliminary framework.

An enormous infrastructure has provided many of our nation's schools with the equipment and connectivity needed to ensure computer integration in the classroom. Integration models have described successful characteristics needed for the overall planning and implementation of technology use as well as for teacher training (Grant, 2000). Professional organizations, government agencies, and private sponsors have expressed a general consensus that one of the most important steps in effectively incorporating technology into education is preparing teachers. They have provided the funding and mandated that a percentage of their allocations go toward teacher training. Universities have implemented programs to equip preservice teachers with the skills and knowledge to use technology in their classrooms. State, district, and local levels of education have increased technology spending and revised their technology plans to implement a variety of educator training programs such as in-service day workshops, after-school workshops, conferences, seminars, and "train the trainer" models to accommodate the requirement to train inservice teachers. Yet despite the general framework provided thus far, to a large degree teachers have not shown any sudden shift in wanting to integrate technology. If technology is to reform education the way it has the rest of the world and teachers are to become motivated and energized with new ideas, then their voice needs to have an impact in the shaping of the reform where it ultimately counts–in the classroom.

In an attempt to learn what teachers had to say, a pilot study was begun by a beginning doctoral student. This study was conducted at a middle school situated in a rural, low socioeconomic county of North Carolina. Some very simple, yet important pieces emerged in how to assist teachers in learning to use technology and in providing a school with concrete steps to encourage this technology integration. This school was chosen for the study because of a prior ongoing relationship the doctoral student (trainer) had with the school in technology training. In June of 2000, the teachers of the participating school were trained in many aspects of computer skills and technology integration during a two-day workshop. Another invitation was received for teacher training and in August 2000 teachers reviewed what had been learned in the previous workshop. In addition to a review, teachers were introduced to a web site designed by the trainer to test an online method of technological support that would provide ongoing communication and resources. A half-day workshop was offered without cost as reciprocity for the school's willingness to participate in the research. This workshop was given to twelve of the teachers in late August.

A major concern throughout the study was how to maintain objectivity since the trainer designed many of the materials being used. Some of these materials and ideas were found to be ineffective while others worked extremely well. The ultimate goal of the study was to find some practical strategies or "pieces," that would provide teachers with effective tools to begin arranging their picture of technology integration. Would an online support system offer help in this process? And if what teachers still need are the basic technology skills, how can they be presented so that teachers will begin to use them in the classroom? Throughout the study great effort was made to listen to what teachers had to say in their attempts to use these resources.

The Research Study

In June 2000, teachers were trained in various aspects of technology integration. The goals of the workshop were to:

- Familiarize teachers with each of the major competencies and objectives of the state technology requirements for teachers and students, and provide background knowledge of how each of the objectives is built upon skills learned as early as kindergarten.
  Example: 6th grade Objective 2.2: Create/modify a database relevant to classroom assignments. (North Carolina, 1998).
- Break the objectives into individual and manageable skills or chunks that could be practically integrated into classroom instruction.
- Practice brainstorming lesson ideas and spend time creating lesson plans that integrate content areas with the individual computer skills.
- Provide further understanding of technology integration by modeling effective lessons.
- Schedule time to practice, implement, and record personal development in technology integration in a portfolio.

Before the workshop in June 2000, teachers completed a survey that identified the types of technology used, how often it had been used with students, and their beliefs about technology integration. Teachers were asked, "Do you think that you should be using technology in the classroom more?" and "If you were told that your use of technology in the classroom should become part of your yearly evaluation as a teacher would you be positively motivated to learn it?" On a scale of 1-4, with 4 being "yes, to a large degree," most teachers answered 3 or 4 on both questions.

Prior to beginning the workshop in August, the survey results were shared with the new principal. During this workshop, teachers reviewed what they had learned in June, reviewed the integration materials, and planned their technology goals for the school year. Teams of teachers were partnered and together they planned a schedule in which they would write a technology lesson and practice it together. During the following month, they would teach the lesson. At the workshop teachers were also introduced to a commercial web site at Blackboard.com (http://www.blackboard.com) that was set up by the trainer to test the idea as an online form of ongoing support and access to technology resources. They expressed much enthusiasm about using the site and because of their enthusiasm it was thought that this could be a vital method for providing the much-needed support usually lacking in technology training (Schlager & Schank, 1997). Leaving teachers with concrete plans and enthusiasm about using the web site were thought to be significant steps in getting the teachers to begin their efforts in using technology. After this workshop, a letter was sent to the principal explaining what was seen as the current state of technology in the school and to encourage further development in this area.

In a half-day workshop in late August, teachers were to be introduced to the many features of the Blackboard web site that could be helpful in encouraging their technology growth. Having only used locally installed software on the school's computers in previous workshops it was not anticipated how incapable the outdated equipment would be for this workshop in which the Internet was needed. Trying to explore the web site on these computers was futile. However, it proved to be a great opportunity to model for novice users how to handle the frustrations that so often accompany the use of technology. Because of the mounting frustration and lack of time, the focus of the workshop (and consequently the research inquiry) was changed from testing an online support system to technology team planning. Teachers chose partners and spent the next hour in technology planning. Before the teachers moved to separate rooms they were provided with an agenda of what they should accomplish during this planning time and reminded to take the materials they had previously received in workshops.

The agenda included five steps: plan your lesson, practice the lesson with the group, schedule a date to teach the lesson, schedule the next planning meeting, and record personal technology growth in portfolios. Teachers had received a template, "Technology Mini Lesson Plan" during their previous training. This template was created as a simple guide to assist teachers in the thinking process of including a manageable chunk of technology while planning a classroom lesson in their own content areas. Teachers had received step-by-step instructions for completing the lesson plan and during the June two-day workshop each teacher wrote five lesson plans using the template. Before using the plan on this particular day, the lesson template was amended and further explanations added as a guide for filling in each section. This same template was also used successfully during a graduate class in technology integration with inservice teachers. With this prior success and the previous training the teachers had received on the use of the template, it was assumed that the same success would be observed. From recording this planning session, several emerging pieces became very clear. Teachers did not clearly understand the various technology applications and their uses. Because of this they were unable to choose a specific skill or objective within an application to make the technology component of the lesson manageable. Although, in several workshops the teachers had been introduced to computer applications and breaking computer skills into chunks, they had not remembered this and did not refer to the notebook materials that may have provided direction. They also skipped around while filling out the form when logically one section should progress to the next. This only seemed to add confusion to the process and prevented the teachers from getting the lesson completed.

On an optimistic note, teachers were focusing on their content area and even trying to expand the lesson in a variety of ways. Their desire and suggested ideas for enhancement of the lesson would have added variety in both content and technology. The vocational teacher monitored the practice sessions and this proved to be a great benefit to the teachers in understanding specific problems. By monitoring the team planning sessions, she identified a fundamental obstacle with most teachers–they did not know how to choose small chunks (or objectives) from the computer applications to include in their lessons. Teachers completed surveys after the workshop that added some optimism for the outcome of the team planning sessions. Survey results were corroborated on questionnaires and through formal interviews: Question: How did you feel about working in teams to learn how to integrate technology? Answers:

- "Great! Two heads are better than one and working together may allow me to get different ideas,"
- "It helped me out just by watching someone else go through the motions and explain every step."
- "Teams are always helpful; sharing different teaching strategies you're more incline to use them."

Question: How do you feel the meeting itself will influence your learning to use technology in your classroom instruction? Answers:

- "I will be more apt to try it since I know I can run down the hall for help!"
- "It will help with thinking of strategies when planning. "
- "You're more inclined to teach the skill as a team project rather than individually."

> "The technology team gave me the boost of confidence and assurance that I could have successful as well as meaningful lessons using technology."

> "It was fun, their input…you know if you have three people looking at a problem you might get three different solutions or three new ideas, three different ways of doing it and to me that's important that maybe there are some other ways, and somebody might benefit from it."

After the workshop an impromptu meeting took place with the principal and the vocational teacher. The principal shared, "I want you to know that your letters keep me focused, and that's what I need in technology. It's an area that's easy to overlook. I agree with you that the teachers will not grow if this is all that they get. They need something that will make them continue to use it." She then asked for feedback on some ideas she was considering for her staff: (1) Teams were to make technology planning a part of their regular weekly team-planning times, (2) they were to write one technology lesson and schedule a date to teach the lesson and provide this information to the office, (3) and they were to be evaluated monthly during the teaching of a technology lesson.

Brainstorming began and through further discussion other ideas were developed to encourage the use of technology within the school. After the workshop a letter was sent to the principal to outline the ideas discussed, share the workshop survey results, and to offer support for her efforts:

> "These answers lend more credibility to the ideas you shared after the workshop about requiring teachers to include technology as part of their planning. I believe if you will implement the ideas you mentioned you will see more conscious effort among your teachers to include technology."

Part of the team-planning meeting was to practice the lesson but the teachers did not have time for this. A return trip was scheduled a few weeks later to observe the teachers during their practice. In the meantime, the teachers had revised their lesson plan with the help of the vocational teacher and had already practiced the lesson on several occasions. They were eager to share their results and proud of what they had accomplished. One of the teachers commented on a questionnaire completed after teaching the lesson, "I feel very confident and proud I used technology with my lesson content…I now feel even more comfortable using technology in my class lessons." Upon examination of the revised lesson plan, it was evident that they now had a much better understanding of the technology application and how to choose a specific skill to teach. However, during the practice session another important piece of the puzzle emerged.

The teachers had chosen a clear objective, "Students will enter information about mythical gods and goddesses into a database." After a short review of mythology, the teacher went to the computer to demonstrate what students would do on the database. The trainer, acting as a student raised her hand and asked, "Teacher, what is a database?" At this point the teachers found that they still did not have enough background knowledge to support the use of this application with students. A mini-lesson in database was provided and teachers expressed how much more confident they felt having this knowledge. Encouragement and praise was offered for their efforts and a date scheduled for observing the lesson. A formal interview with the vocational teacher later that afternoon confirmed what had been observed during the practice session, "Yes, at the planning sessions teachers chose whatever computer skill they wanted to use in a lesson and they didn't choose what should have been taught first, 'an introduction to database.' Teachers needed a sequence of skills to follow. Then they would've had this background knowledge." This piece, which should have been reinforced, was another false assumption that the process of learning to sequence in one curriculum would transfer to another. This did not appear to be the case when learning to teach lessons that include computer skills.

The following week each of the teachers taught their lessons and was again observed. Documents used during the lessons were collected and examined. The trainer, in order to measure the components of an effective technology lesson, created a formative evaluation instrument. This instrument was a combination of measures borrowed from other evaluation measures and the personal knowledge and experience of the trainer. Therefore, the instrument could only be considered an informal means of gauging the use of certain technology components.

One class had 9 students in 6th grade. This teacher was in her 9th year of teaching and this was not her first lesson using the integration of technology. The other class had 7 students in 8th grade. This teacher, while not a certified teacher, was a full-time tutor at the school. She was in her first year of teaching. These two teachers taught their lesson in the same room that housed only one computer and one printer. Students in both these classes were performing at grade level. The third teacher, in her 3rd year of teaching, taught her lesson in a room with 8 computers. In this class, there were 11 special education students who were performing at a 3rd grade level. During each of the lessons the teachers used the same strategy of pairing two students at the computer while other students worked on seatwork in the content area. Following is a brief summary of the observations recorded during the lessons:

Strengths:

- 2 of the 3 teachers provided adequate background information for database; 1 provided exemplary knowledge of the subject; 2 of the 3 provided a review in the content area.
- 2 of the 3 had the objectives clearly written on the board for both content and computer areas.
- All teachers had materials ready and they effectively managed the instructional time with both the students at the computer and those at their seats.
- All teachers were exemplary in explaining to students the process they were to follow: what they were to do at the computer, at their seats while waiting their turn, and how they would take their turns at the computer.
- Effective strategies were used to account for the available equipment and needs of the students.
- All teachers maintained a focus on the content area rather than on the technology.
- Technological problems occurred with 2 of the 3 teachers and it was adequately handled and the lesson was continued.
- All students in 2 of the 3 classes were able to participate at the computer during the lesson. Only in the special education class were all students not able to take their turn. In this case, it would be more realistic and effective to continue the lesson for several days.
- Collaboration among students working at the computer was encouraged in 2 of the 3 classes. In the special education class one student was to mentor the next student in what they were to do.

Areas for Improvement:

- 2 of the 3 teachers did not provide for students a real connection from the content area to the use of the database. This may have been due to their lack of knowledge, adequate practice, or simply being new to using technology.
- Only one teacher completed the lesson with enough time for closure and assessment of learning.
- Seatwork was adequately used as a strategy in a one-computer classroom for a beginning technology lesson. However, in time and with more practice it would be anticipated that a diversity of strategies would be used to actively involve more of the students in the lesson by using a computer presentation device which the school has available.

After the process of planning, practicing, and teaching the technology lessons these teachers answered a questionnaire about their experience. The following is a summary of some of their answers:

- Training or staff development and practicing helped them the most to prepare and perfect the lesson.
- The lesson plan template was helpful as a guide and to provide step-by-step instructions.
- The team planning session boosted confidence and helped in knowing what to expect.
- The in-house technology expert was a valuable resource in planning. "She gave technology hints and advice; showed them what was wrong and how to correct it; and helped them narrow the lesson."

Surveys taken by twelve teachers appear to confirm some of these findings. When asked, "What do you think teachers mainly need in a personal way to be able to integrate technology?" Ten out of twelve had common responses, "more training, more time to plan for it, and more knowledge of computer skills."

Before the study was officially completed a formal interview was conducted with the principal. She shared that her team leaders had been informed that technology planning was to be a part of their weekly team meetings and that they would be evaluated once a month during one of these lessons. She described how her function as an administrator was to communicate with her teachers that technology was to be one of their major goals. Again she insisted, "You keep me focused; I need you to keep communicating and sharing with me about technology, to keep us on track."

Conclusions

Some of these simple technology "puzzle pieces" have already been identified through other studies and this paper tends to confirm what has been already found. Because of the rapidly changing nature of technology, much of the literature seems so quickly outdated or has been extended beyond the initial stages of technology integration and does not address the needs of beginning technology users. Many educators have not even yet begun to include technology in their instruction so this study could be most useful in reminding administrators, technology specialists, and trainers that there are still teachers who need the basic skills before they will be eager and able to use technology in the classroom. Training and materials for inservice teachers should combine technology instruction for personal use and strategies for using the technology as an instructional resource. Although many states provide a computer skills curriculum for the vocational teacher or computer lab instructor, this comprehensive curriculum may offer much more than any classroom teacher could begin to process when combined with their other responsibilities. Even so, classroom teachers need some type of guidelines if they are expected to integrate one curriculum with another. This curriculum, as in the case of any good curriculum, should be a logically sequenced method of including computer objectives in the content area curricula but possibly in a condensed or simplified form that could be easily referenced by the classroom teacher. Regularly scheduled planning and practice sessions may increase in-house technology support, peer collaboration, and comfort level of teachers. As much of the literature before has indicated, most teachers will probably only grow in their desire and ability to integrate technology in their classroom instruction if it is strongly supported and encouraged by an administrator. More administrators may be receptive and enthusiastic about providing this support and encouragement if they were kept "focused," or given ideas by technology resource personnel. Further study would be useful in identifying an effective, but simplified version of a computer curriculum for classroom teachers. In addition, as more educators learn to integrate technology, administrators will need more appropriate and valid instruments to evaluate instruction of integrated lessons. In order to be qualified as evaluators of technology instruction, administrators will also need further training in the use of technology, methods and strategies that prove most effective, and characteristic differences in learning environments when technology is used as a resource. Finally, even though an online technology support system was not fully developed in this study due to inadequate equipment and time constraints, its potential should be further examined.

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The Unique Impact of Internet Instruction on Future Teachers: A Qualitative Study of Delivery Systems and Their Impact

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Abstract: Recent teacher shortages and the growing popularity of teaching as a viable career change has led to a blossoming of many graduate teacher education programs. Distance education is especially attractive to these students since many have families and must maintain jobs. However, many teacher educators are still suspicious. This paper summarizes a qualitative study, which looked at two required courses in the graduate teacher certification program at a teacher training university. Two groups of students participated in these courses in the traditional manner of traveling to the university and attending classes. Two other groups of students took the identical courses over the internet. The same two instructors instructed all four courses. This study followed these students not only while they took the courses, but also as they continued their studies and in some cases, when they started teaching in their own classrooms. The results suggest that while the instructional delivery models may have impact on course objectives, the greater impact may be upon a future teacher's attitude toward the effective use of technology in the classroom.

Introduction

Recent teacher shortages and the growing popularity of teaching as a viable career change have led to a blossoming of many graduate teacher education programs. Distance education is especially attractive to these students since many have families and must maintain jobs. In fact, as distance education becomes routine at even the most established universities, future teachers are able to take a significant number of courses through distance education.

At this time, there appears to be at least two models of distance education that are becoming popular. There is the classroom distance education model, and an emerging model of instruction being presented over the internet. In the classroom model, students sit in a specially designed room and view a projected television image while their image is beamed back to the instructor via television cameras. These facilities are usually fairly high in cost to establish and operate and requires students to travel to a specially equipped facility, not much different than current educational practices of having students attend classes at the university.

The internet model can be broken down into two variations- asynchronous and synchronous instruction. Asynchronous instruction, meaning students view materials posted by the instructor or by other students at any convenient time, is readily supported by most institutions by making available various pieces of template software that allow a faculty member to create course materials fairly easily. This type of course support is necessary for any internet instruction, but lacks the interaction of a live class. Many students report feelings of isolation and find it difficult to remain motivated using this type of instruction.

The synchronous internet model, gaining popularity with business and industry for training, allows the instructor to be in one location and students in different locations, their schools, homes, offices, or a computer laboratory, for example. The instructor is similarly in another location. Instruction takes place using streaming video, audio, white boards, and similar technologies. Students and the instructor can see and participate with one another, much like in a regular classroom. Students no longer need to travel to a central location for a class, and there is live communication and interaction taking place. This type of instruction is less expensive in terms of facilities, but does require expenditures for special software and some hardware on the part of the student.

The advantages of either type of delivery system have been celebrated on numerous occasions.

Disregarding the financial issues, the positive potential for instruction cannot be denied in certain circumstances (Teh, 1999). Berger (1999) has justifiably pointed out the potential for global learning over the internet.

However, many teacher educators are still suspicious that web based instruction, while adequate in some situations, still falls short when teaching future teachers the skills necessary to function in current classrooms. Many anecdotal studies have taken this more cautious approach to web based delivery systems. (see Dewald, 1999; Waters, 1999; Sullivan, 1998). While there may be advantages in terms of convenience, the pedagogical advantages might be limited and need to be explored in more detail.

This paper summarizes a qualitative study which looked at two required courses in the graduate teacher certification program at a teacher training university. Two groups of students participated in these courses in the traditional manner of traveling to the university and attending classes. Two other groups of students took the identical courses over the internet, one using the synchronous model and one class utilizing asynchronous web based instruction. All four courses were instructed by the same two instructors. This study followed these students not only while they took the courses, but also as they continued their studies and in some cases, when they started teaching in their own classrooms.

The Study

Since the university has a carefully monitored curriculum process, both courses had to offer similar content. One class was an introduction to the internet for teachers. This course had traditionally been offered in a lab classroom at the university and relied heavily on project based instruction. The other course was an overview of schools and their place in the community. This course had included internet components in the past, but had not required extensive use of web based resources.

Students were interviewed in focus groups prior to taking the course and upon completion of the course. In addition, follow up interviews were conducted based on a willingness to participate. Surveys were also administered at the end of the course which focused on instructional issues. The instructors then interviewed each other focusing on the common experience of offering courses at the university and over the internet. Taken all together, this interview and survey data from instructors and students gave a good picture of the issues involved in this type of teacher education.

Findings

As might be expected, the variety of responses suggest that the learning style of the students is a consideration, but not to the degree as might be expected. There was no general pattern which emerged which suggested that those students with a certain learning style were more suited to internet or classroom instruction. This might suggest that a wide range of students may find internet instruction, in certain situations, a viable option. Students in the "Internet for Educators" course clearly gained additional benefits by having the class conducted over the internet. They felt they were more self-reliant, better able to solve technological problems, and had a better understanding of the capabilities of internet instruction for their own classrooms. Students who took this course at the university felt the course was valuable, but did not report these positive trends in their own learning to the degree reported in the internet only course. The fact that this course was offered in the synchronous mode turned out to be of limited importance. The course evolved to the point that the project based approach really did not require the entire class to be on line at the same time.

The instructor for this course had taught internet based courses in the past and was technologically skilled enough to answer all technical questions. Also, having taught internet based courses in the past, he was concerned that the amount of instructor time would be far greater when so many individuals demanded increased attention. His experience has suggested that internet based courses were far more work than regular, classroom based instruction. However, since this was a project based course relying on internet resources, he documented that this course did not take any additional time than the lab based course.

In short, the data suggests that as long as the course is project based, internet based instruction in this particular course, "Internet for the Teacher", is superior to lab based instruction on site. The course did not require additional instructor time, and the students reported that they became more skilled in their use of internet resources than those in the lab classroom. The key, however, seems to be that the instruction was project based. Whether the course was offered in synchronous or asynchronous mode did not seem to be an issue with this particular course.

Students in the "Teacher and the School Community" had a very different reaction. Those taking the class at the university felt that they had been exposed to new issues, had interacted with their colleagues in new and meaningful ways, and had a better understanding of where they might fit into a community once they became teachers. The course content allowed frequent field trips and the opportunity to question guest speakers in person. Students who took the course on site repeatedly commented that these opportunities were the best learning experiences the course had to offer.

Students who took a portion of this course over the internet felt they had gained valuable technical experience, but did not feel that they had significantly grown in these same areas. They felt that the spontaneous interaction was lacking, since this course was offered in the asynchronous mode. Chat room discussions or conferencing on particular topics was useful, but "slowed down" the process by which students might clarify and synthesize ideas. Many commented on the fact that they felt disconnected from the instructor. Several mentioned that they did not exactly understand the role of the instructor in that he only seemed to "worry about setting up activities on the web." The web based assignments were group projects, which seemed to have potential with this type of delivery system. Unfortunately, many commented on the difficulties of interacting with each other which led to frequent frustration and an exclusive focus on technology issues.

Conclusions

Follow up interviews indicate that those students taking these courses over the web gained useful technological skills which they have been able to apply both in other courses and in the teaching field. In retrospect, those who took the "Teacher and School Community" course over the web do not feel they have "missed a significant opportunity." Many commented on the fact that the limitations of web based instruction has proved to be a useful lesson in that they can critically analyze the benefits and pitfalls of internet based instruction.

One of the most useful products of this study was the dialogue established by the two instructors. The "Internet for Teachers" course had a distinct advantage in requiring individualized work and instruction. The "Teacher and School Community" course, relying on web discussions in chat rooms and group projects, suffered. The instructors learned from each other in that future courses will make appropriate modifications to explore more effective ways to promote instructional strategies other than project based learning. The issues involved in web based delivery seem to cross disciplines and what may work with one content area may cause problems in another. Helmi, Haynes and Maun (2000) noticed that the experiences and potential solutions to this type of instruction may in fact create useful bridges between disciplines which may lead to interdisciplinary instruction. This is exactly what happened in this particular case.

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On Integrating IT into Teaching of English in Taiwan Junior High School

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Abstract: The goal of this study is to investigate the support and training needed in integrating information technology (IT) with teaching of English as a foreign language. Two junior high school English language teachers were given 20 hours of basic computer software training along with 15 group discussions on how to integrate IT into classrooms. Teaching experiments were then conducted in 8 class periods. The major findings of the study are: (1) training of computer skills needs to focus more on the short-cuts of operating a software; (2) CAI titles that facilitate IT induced instruction is yet to be improved; and (3) full support from the school, both administrative and technical personnel are necessary for the long term implementation of IT integration into classrooms.

Introduction

K-9 curriculum in Taiwan has undergone major changes in the last few years. With the advance of information technology (IT), not only are information technology courses being taught in the K-9 schools, the new K-9 curriculum calls for full integration of information technology into teaching of all subject areas. Thus, not only will the students be IT informed; teachers also need to be IT trained to be qualified educators of tomorrow.

Although the newly graduated teachers are most likely IT trained, most of the teaching force are educated from yesteryears; thus lacking suitable IT training, making integration of information technology into teaching a difficult task. The Taiwan Ministry of Education sponsors many on-the-job IT training courses to teachers through colleges and universities in Taiwan. These courses range from introductory hands-on courses to theoretical advanced network management course. Furthermore, special funding was appropriated to all K-9 schools to training teachers of their respective schools. Thus, it is safe to say that most teachers are at least aware of the inevitable changes brought on by the advancement of information technology.

Taiwan's new K-12 curriculum guideline has now mandated that foreign language courses be offered to all students beginning at the 5th grade. With the government's will to push ahead the use of IT in the educational sector (Lee & Wu, 2000) and the requirement for studying foreign languages by all students, the need for effective teaching of foreign language is more pressing now then ever before. In this study, we invite junior high school English teachers to join us on learning to integrate IT tour. By experimenting with using IT in their classrooms, it is hoped that the experience learned can be shared among all teachers in Taiwan.

Related Research

In this day of information age, teachers are increasingly under pressure to use technology as a learning tool and to integrate technology into classroom instruction (Scheffler & Logan, 1999). In many ways, integration strategy is often guided by different factors including equipment accessibility, educational objectives, students' needs and the teachers' technical know-how (Halpin, 1998). In a report by OTA (1995), a number of common barriers exist among the teachers in using technology in classroom instructions. For one, many teachers lack a clear understanding about what resources technology can offer them as they try to meet their instructional goals. Yet another is that teachers need extra time to experiment with new technology and plan lessons using new methods that incorporate technologies. In terms of integration IT into teaching and learning, Roblyer (1997) classified the efforts into 6 categories. On a more abstract level, we can also categorize the experiments in the literatures into 2 categories based on who is required to operate the IT equipments in the learning process.

Student-centered IT induced activities: Many of the experiments reported in the literatures involve the students using the IT equipments in fulfilling the assignment given by the teachers. For example, in "Project with Teeth" exercise by Roblyer (2000), teachers use e-mail to connect K-3 students with "Keypals" around the world. The students interchange how many teeth the children lose during the year. Thus the students must practice their writing via email message to their keypals. Another example also by Roblyer is to let students use word-processing tools or crossword puzzles generators to develop several test items over the learning contest. It was argued that this hands-on approach helps students retain more because they themselves generate the questions. In both cases, the teaching or learning is student-centered. Furthermore, students must have adequate access to computing equipments. Thus activities such as those are only possible in a learning environment where students and teachers alike have ample computer access opportunities.

Teacher-centered IT induced activities: In contrast to student-centered IT activities, a teacher-centered IT activity is one in which the teacher is in charge of operation of the IT equipments. Here IT equipments are used merely as a teaching aid as oppose to self-learning facilitator. For example, a teacher may use PowerPoint as a delivery-metaphor technology. In Saye (1998) group of 10 teachers experienced with transforming teaching material into digital forms. So instead of chalk and board, teachers used computers and LCD monitors/projectors in class. However, if not carefully planned, teacher-centered IT induced lesson can cause many classroom management problems (Mason & Hlynka, 1998). A different use of IT is exemplified by the "Project Essay Grade" (Jones, 1999), in which English teachers use computer and essay analyzer to help grading students' writing. The analyzer can look at five specific traits, namely content, organization style, mechanics and creativity and provide feedback to the teachers. Thus saving teachers' time in grading essays.

Experiment Setup

This study was carried out at a municipal junior high school where the principle has agreed to allow schoolteachers to try out new teaching methods as would be required by this study. The procedure of the study is as follow. First, participating English teachers were gathered through a general call for participation. No pressures from the school principal were exerted on any of the teachers, so all joined were on voluntary basis. Bi-weekly meetings with participating teachers were then held to give the teachers a sense of the current state of IT and of how teachers in other parts of the world are using IT in their instructional activities. More importantly, the meetings allowed the teachers to express their opinions on how IT can be integrated into their classrooms and allowed us to formulate the necessary training courses for those teachers. After the training, the teachers began to practice integrating IT into their teaching. Students were asked to fill out questionnaires, with both Liker-scaled questions and open-ended questions, at the end of the teaching experiment, which the teachers have post-experiment interviews. In addition, teachers were asked to keep a teaching journal detailing their thoughts on the experiment. After analyzing all the data gathered during this study, one last meeting was conducted with the teachers to resolve any unanswered question at the data analysis phase. Timetable of this study is outlined in Table 1, and a brief account of each stage of the study is given below.

1. **General preparation:** Ten teachers volunteered for this study at the outset. However, only 2 made it through the teaching experiment. The other 8 dropped out of the study when it comes time to design their own IT integrated teaching plans. The most often cited reason for dropping out was heavy teaching duties and not having enough time to do the extra work. The two remaining teachers all have 3 plus years of teaching experience and are casual users of computer even before this study. Three discussion sessions were held to let the participating teachers be acquainted with the research team and to gather information about the school. Thus, topics of discussion range from school's computing environment to how the teaching of English language is being conducted.

2. **Learning about IT integrated teaching:** Four discussion sessions were held with participating teachers to discuss possibilities of integrating IT into teaching and into classroom activities. During these four meetings the research team show the teachers the teaching resources that are available on the Internet and

Stage	Session No.	No. of Participants	Activities
General preparation	1 2 3	10 6 7	1. Go over the nature of this study. 2. Get an understanding of participating teachers' IT skills. 3. Get an overview of schools' IT facilities. 4. Get some understanding of the teaching methods and classroom activities for teaching English as a second language.
Learning about IT integrated teaching	4 5 6 7	8 8 10 8	1. Demonstrate the teaching resources that are available on the Internet. 2. Show examples from the literatures and the Internet on various IT usages in teaching of English.
Preparing for IT integrated teaching	8 9 10 11	10 3 3 2	1. IT proficiency training (20 hours). 2. Design of teaching methods and classroom activities.
Experiment	12 13 14 15	2 2 2 2	1. Experiment with IT assisted instruction in 2 classes for a period of 4 weeks (2 in the regular semester, 2 in the summer sessions). 2. Getting feedbacks from students. 3. Discussions with the teachers on the pros and cons of preparing and using IT in the classrooms.

Table 1: Time line of the experimental study.

discussed about other IT integrated teaching projects reported in the literature. During these discussion sessions, it was determined the type of IT trainings those participating teachers needed the most.

3. **Preparing for IT integrated teaching:** There are two objectives during this stage: participating teachers' IT training and design of teaching plans for use in the experimentation stage. Twenty hours of computer usage training were provided to the participating teachers to ensure they have enough IT background to conduct IT integrated teaching activities. The topics of the training were results of the previous discussion sessions and the trainings were all conducted at the school's new multimedia computer PC lab. The training covered the topics of Windows 98 (2 hours), Word (8 hours), Power Point (4 hours) and Internet basics (6 hours). Class notes and exercises were all specially prepared to ensure quick learning results. Upon completion of the computer usage training, teachers were asked to design teaching plans to include classroom activities that involve usage of IT equipments. Although only two participating teachers remain at this point, both were very enthusiastic about the opportunity to experiment with new teaching methods. Over a period of 4 weeks, those two teachers refined their teaching plans and prepared the necessary teaching aids (e.g. Power Point slides, scanning of pictures) all by themselves.

4. **Experiment:** Eight hours of teaching experiments were carried out in two different classes toward the end of the semester (actually 2 weeks at the end of the semester, 2 in the summer). All the experiments were done in a classroom equipped with LCD projector. The teachers had to bring in their own notebook computer and setup it up on their own. Each lecture was tape-recorded for future analysis. The two classes were chosen for the simple reason that their schedule matches with that of the research team. As it turned out, the first class (Class A) is a model class in which all the teachers praise about the good study habits of the students in the class. On the other hand, the second class (Class B) is a complete opposite of the first class in which the motivation to learn is non-existence among the students in the class. At the conclusion of the experiment, students in both classes were asked to fill out a survey to give their thoughts on the new teaching method. The questionnaire focused on whether IT integrated teaching will better attract and retains attention and on its effect on learning. The questionnaire and the results are given in Table 2. The teachers were also interviewed after the experiment with questions relating to teaching preparations and classroom management.

Experience Learned and Discussions

Thoughts from the Students on IT-Integration

The students' questionnaire and summary of their responses are given in Table 2. From the table, several observations can be made. In general Class A (the model class) gave more favorable response than Class B in all questions by a large margin. Furthermore, majority of the Class B responses fall into the indifference category, meaning that the students do not care much about the new teaching/learning method. This can be attributed to the fact that students in Class B are less motivated to learn. Anything the teachers try is probably fruitless. Looking at Questions 7 and 8, although only 30% of students in Class B liked the IT induced classroom activities, 42% favored the use of CAI software to ease the pressure of learning (English). This observation raised an issue for future study. That is what type of classroom IT activities can help bring about students' desire to learn foreign language, or any school subject for that matter.

As for Class A, it is interesting to know that although only between 41% and 60% (questions 4 to 6) of students think that IT aided teaching method facilitated their learning, 71% liked the new teaching method over the traditional mean (question 8) and that only 6% of the students dislike the IT induced classroom activities (question 3). Again, a future in depth study of the correlation between IT induced classroom activities and students' learning progress is warranted.

Questions	Class A (35 students)			Class B (33 students)		
	agree	indifference	disagree	agree	indifference	disagree
1. Use of CAI in the classroom can raise my interest in learning English.	25 (71%)	8 (23%)	2 (6%)	11 (33%)	11 (33%)	11 (33%)
2. I can better focus my attention in class when IT is used during the class.	23 (66%)	10 (29%)	2 (6%)	8 (24%)	17 (52%)	8 (24%)
3. I am more inclined to join in on the classroom activity when the activity involves usage of IT equipments.	25 (71%)	8 (23%)	2 (6%)	8 (24%)	16 (48%)	9 (27%)
4. The computer animation of CAI software used in class can facilitate my learning of new words and phrases.	21 (60%)	10 (29%)	4 (11%)	10 (30%)	14 (42%)	9 (27%)
5. The computer animation of CAI software used in class can facilitate my learning of new sentence structures.	18 (51%)	11 (31%)	6 (17%)	8 (24%)	15 (45%)	10 (30%)
6. I am more inclined to practice English conversation in class with a CAI software.	15 (43%)	18 (51%)	2 (6%)	6 (18%)	19 (58%)	8 (24%)
7. Use of CAI software in the classroom eases my pressure of learning English.	23 (66%)	11 (31%)	1 (3%)	14 (42%)	12 (36%)	7 (21%)
8. In general, I like the new IT facilitated way of learning English.	25 (71%)	8 (23%)	2 (6%)	10 (30%)	16 (48%)	7 (21%)

Table 2: Students' questionnaire and summary of their responses.

Thoughts from the Teachers

At the outset of this study, both teachers were having doubts about the feasibility of integrating IT into classroom instruction, let alone that the ever presence of the National High School Entrance exam makes any deviations from routine teaching/learning method susceptible to challenges from parents. However, after one semester of experimentation, both teachers have outgrown their initial skepticism and now embrace the idea of integrating IT into their teaching. From this study, we are also able to conclude that teachers are like students in terms of installing new teaching method. At first, they need to be guided. With a few IT integrated teaching sessions under their belt, they will be more enthusiastic and be able to design and implement IT integrated lesson plans on their own. The following is a brief summary of the experience that the two teachers have shared with us.

Teaching preparation

As can be expected, preparation of IT integrated classroom activities takes more time than the non-IT activities. However, besides shortage of ideas for IT-integrated activities, unfamiliarity with the operations of IT equipments is also a major factor. For example, one of the teachers encountered scanner problem. After running around for help for a couple of hours, the problem was finally resolved, thanks to the school technician. However, an impatient teacher would likely have given up on it if the equipment fails to work properly. Thus it is important to have the teachers properly trained to not only use computer software, but also routine operations of the commonly used IT equipments.

Classroom management

Although neither teacher experienced additional classroom management problems other than those common faced, they did brought to our attention that it is better to prepare additional contingency activities for use during unexpected equipment failure. One of the teachers ran into an unexpected problem during one of her classes. The LCD projector apparently got too warm and it triggered the automatic shut-off and cool down function. For about 10 minutes, the teacher had to do without the projector. Once the "power" was restored, it went off again after only a short while. Students often can get too hyper when unexpected event occurred. Fortunately, the teacher had a contingency plan and the class went on smoothly.

Administrative support

During the course of the experiment, the school administrative support was critical. Since IT integrated teaching is still in the experimental stage in Taiwan, the classrooms were not equipped with the necessary IT equipments. Our teaching experiment was carried out at a make-up IT classroom, equipped with the necessary IT equipments. However, the first few teaching sessions went on with routine calls to the schools maintenance staff to make better the teaching environment. For instance, window blinds or curtains of the class need to be added because the LCD projector was not bright enough. However, the curtain problem was never resolved in a satisfactory way. If it weren't for the teachers' persistence, setbacks like these could discourage teachers from using IT in their instructions.

General comments with regard to IT integrated instruction

Though there were some setbacks at the beginning of the teaching experiment, both teachers were quick to point out the advantages of using IT in the classroom. Though it takes more time and effort to design IT induced teaching plan and that some class time may be lost due to equipment failure, both teachers agreed that the IT integrated activities are more compact than the non-IT activities. As a result, students seemed to concentrate better through out the whole activity. The teachers also pointed out that many of the CAI titles are not suitable as a teaching aid in the traditional classroom setting. The current titles are suitable only for individual viewing only. When it is projected onto the white screen for the whole class, the characters on screen are generally too small to be visible for students sitting in the back of the classroom. The teachers also noted that during our training sessions, we have taught them many ways of accomplishing a task (e.g. copy and paste operations) for reason of completeness. However, they found that during teaching, they often use only one of the many ways, the fastest way! It was recommended that future training courses should include a "short-cut" sessions in which the teachers learn the fastest way of operating around a piece of software.

Concluding Remarks

Teaching of English as a foreign language is very suitable for IT integration because repeated practices on the same content is the major teaching method. With multimedia computer being capable of replacing many of the equipment currently in use in teaching foreign languages, including word cards, audio tapes, situation diagrams, a trivial form of IT integration would be to transform all the material currently in use into digital form so that students can have access to the same material for practicing at home. With the suggestions of the experienced English teachers, we are currently working on a word card system for which the teachers can easily create electronic word cards for use in IT equipped classrooms.

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In-Service Teacher Development for Fostering Problem-Based Integration of Technology

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Abstract: This paper reports on professional development approach, used in an Indiana-based Technology Innovation Challenge Grant, for middle and high school teachers designed to promote problem-centered uses of technology. As an initial activity, in-service teachers, pre-service teachers, and grade 6-12 students took part in a two-day modeling activity using technology to investigate and report on a local community problem. This allowed teachers to experience problem-based learning and understand the elements of the process. Evaluation of the modeling activity showed positive reactions from both teachers and students. Subsequently, teachers took part in a semester-long, school-based course involving a number of problem-centered activities. Teachers developed their own problem-centered projects that contained appropriate elements of problem-based learning. These findings suggest that the professional development approach used in this project was effective.

Introduction

Fast-paced life in the 21st century will demand adaptability, problem-solving, and continual learning. A recent Presidential panel report (Panel on Educational Technology, 1997) stated that 21st century workers must possess "the capacity to readily acquire new knowledge, to solve new problems, and to employ creativity and critical thinking in the design of new approaches to existing problems" (p 6). Because of these demands, there is growing emphasis in educational reform efforts on learning models based on students' active construction of knowledge and skills. Learners must learn how to learn if they are to be successful in a rapidly changing world.

Two similar learning models, problem-based learning (Torp & Sage, 1998) and project-based learning (Krajcik, Czerniak, & Berger, 1999), embrace this perspective on students' construction of understanding and show great promise for helping learners acquire knowledge and skills while using technology as an authentic tool . Although the specifics of problem- and project-based learning vary somewhat, they share an emphasis on situated learning (Brown, Collins, & Duguid, 1991) in authentic contexts (Stepien & Gallagher, 1993). Authentic problems anchor the curriculum and provide a vehicle for both problem-solving and content learning. In general, this approach is characterized by: (1) use of an ill-structured problem or driving question that provides opportunities for student investigations and problem-solving; (2) student analysis of the overarching problem or question to identify a specific problem for investigation (e.g., identifying what is known and unknown); (3) student-conducted investigations or actions that typically result in the development of artifacts or products; (4) collaboration among students, teacher, and community; and (5) student presentation of a final report or solution that summarizes the process and findings. Technology can play an integral role throughout this process as a tool for acquiring relevant information, gathering and manipulating data, and producing and presenting the culminating presentation in multimedia format.

For teacher educators, a key issue is how to best help in-service and pre-service teachers learn to apply problem-based methods that effectively integrate technology. Little (1993) argued that traditional models of professional development are not adequate to the task of preparing teachers for the challenges of teaching in the climate of reform. Because of the complexities of pedagogies demanded by learner-centered approaches, deeper and more meaningful professional development experiences are needed. One-shot technology workshops will not work today (if indeed they ever did). The Indiana Education Policy Center (1996) suggested that, to provide for continuous growth, effective professional development must: be school-based, use coaching and follow-up techniques, be collaborative, focus on student learning and be evaluated at least in part on that basis, and be embedded in the daily lives of teachers. Hill (1999) suggested that teacher technology development can rely on the same problem-centered and activity-based methods that are suggested for students in problem- or project-based learning.

This paper reports on the initial professional development activities of an Indiana-based Technology Innovation Challenge Grant project. These professional development activities, launched in the fall of 2000, were conducted by university faculty working in collaboration with teachers from the lead school district. Activities relied on problem-centered approaches to introduce problem-based learning with technology. The goals of the in-service professional development were to: (1) promote teachers' understanding of problem-based learning, (2) facilitate teacher's development of technology integration skills and knowledge, and (3) facilitate teachers' development and implementation of their own problem-based learning activities incorporating technology. The process consisted of an initial problem-based learning modeling activity, designed to show teachers the problem-based method in action, followed by a semester-long, on-site course focused on technology integration and problem-based learning approaches. The process and preliminary outcomes are described here.

Project Background and In-Service Professional Development

Tech-Know-Build: Indiana Students Building Knowledge with Technology is a Technology Innovation Challenge Grant project, funded by the U.S. Department of Education, which deals with problem-based learning approaches integrating the use of technology. Initiated in August of 2000, this five-year project focuses on the development and implementation of a learner-centered and problem-based curriculum, beginning in the sixth grade, involving collaborative construction of knowledge in authentic contexts using technology. Naturally, professional development is an important element of this process. Additional elements of the project include the use of portable technologies, electronic mentoring of K-12 students by university pre-service teachers, and electronic links among project partners and with the larger community. Project partners include the Crawfordsville (Indiana) Community Schools, Indianapolis Public Schools, Purdue University, and Indiana University Purdue University at Indianapolis (IUPUI).

The university partners, working closely with school personnel, direct the teacher professional development component of the project. Purdue University (main campus) has a long history of cooperation with the Crawfordsville Community Schools, the lead school organization. In addition, the Purdue campus is located relatively near (about 30 miles) to Crawfordsville, a small rural community in central Indiana. IUPUI has a similar long-term relationship with, and proximity to, the Indianapolis Public Schools. Hence, Purdue University works primarily with the Crawfordsville Community Schools, and IUPUI works primarily with the

Indianapolis Public Schools on the professional development aspects of this project. Because of funding patterns, grant activities involving Indianapolis teachers will not formally begin until summer of 2001, but activities involving the Crawfordsville teachers began during the fall of 2000.

The professional development activities involving Purdue faculty and teachers in Crawfordsville actually pre-date the grant by several years. In 1997, the Crawfordsville Community Schools launched a project to provide all district teachers with laptop computers. To receive a laptop, teachers had to acquire computer competencies through one of several available means. One of these was completing an on-site introductory educational technology course offered through Purdue University. Since this collaboration began, over 150 teachers have elected to take an introductory and/or advanced educational technology course through Purdue to satisfy the requirement to obtain a laptop computer.

During the fall of 2000, twenty-four Crawfordsville middle and high school teachers enrolled in the advanced educational technology course (EDCI 564, Integration and Management of Computers in Education) as the first group of grant participants. These teachers had already completed the introductory level course, which concentrated primarily on basic computer applications for teacher productivity (e.g., Word, Excel, Powerpoint), or an equivalent alternative. While the first course dealt with learning fundamental computer applications, EDCI 564 focused on integrating educational technologies in the classroom.

As a kick-off activity, we wanted the teachers to see and experience first-hand a problem-based activity involving the use of technology. So, we designed a modeling activity – a short-term problem-based learning activity. Early in the semester, participating teachers along with eighteen students from grades 6-12 and six pre-service teachers from Purdue took part in a two-day problem-based learning activity involving a significant environmental problem (water quality) in the local community. The purpose of the activity was to help the teachers understand the problem-based learning process, the roles of teachers and students, and the use of technology as a supporting tool. We involved pre-service teachers because 1) they brought a high level of technology competence, 2) they could benefit from the experience themselves, and 3) this provided a vehicle for initiating collaboration between the university students and the K-12 teachers and students. We involved K-12 students because a growing body of literature suggests changes in teacher-student relationships can accompany technology integration (e.g., Ertmer & Hruskocy, 1999; Ringstaff & Yocam, 1994). We wanted teachers to work with students as co-learners in this process.

During the two-day activity, mixed teams of participants first were presented with the driving question on water quality, "What's in our water, why is it there, and what does it mean to us?" Teams designed their own investigations within the framework provided by the overarching driving question and conducted their investigations. In most cases teams traveled to field sites to collect water samples and used available water test kits to assess what was in their samples. Finally, each team produced a multimedia report of their investigation and findings, which was then shared with the other teams on the second day. Rather than teaching about technology, the emphasis in this approach was on using technology as an authentic tool to gather background information (e.g., Internet searching), collect data and artifacts (e.g., digital camera photos of field sites, Excel graphs of data), and assemble and present multimedia reports of the investigations (e.g., Powerpoint presentations). Results of an evaluation of this activity are presented below.

Following the modeling activity, the teachers participated in a semester-long in-service development program that consisted of a specially tailored version of the EDCI 564 Purdue course. The professional development course focused on development of participants' knowledge and skills to integrate technology within a problem-based context. Several activities involving the use of technology in a problem-solving context were employed during the course. For example, early in the course, participants engaged in a spreadsheet activity involving prediction of the medal times/distances for track events in the 2000 Summer Olympics in Sydney, which took place during the course. A Webquest activity was used to introduce concepts related to evaluation of websites. A web-based discussion board was utilized to give participants the opportunity to reflect on class topics and interact with peers. A history-based activity required teams of participants to research and develop multimedia presentations to convince their peers of the historical significance of one decade of the 20th century. These activities were designed to demonstrate additional ways that technology could be integrated into the classroom in a problem-centered context. As a culminating course activity, participating teachers developed their own problem-based learning activities, incorporating technology, to be implemented in their own classrooms during the spring of 2001. As a means of sharing their project plans, teachers also produced websites describing their projects.

Outcomes

The two-day modeling activity was viewed as a key element of the professional development approach, because in a relatively short time it allowed teachers to experience the process, understand the roles of teachers and learners in the process, and see effective ways to utilize technology. At the end of the activity, a short evaluation form was administered to all participants. This evaluation form consisted of eight Likert-type items, five semantic differential items, and five open-ended items. Table 1 presents the mean ratings by participant group for the Likert-type and semantic differential items.

Evaluation Item	Mean Rating Grade 6-12 Students (n=14)	Pre-Service Teachers (n=6)	In-Service Teachers (n=23)
Likert-type Items			
1. In this activity, I feel like I learned a lot of science.	4.36	3.67	3.74
2. In this activity, I feel like I learned new things about using technology.	4.29	3.83	3.91
3. I would rather work by myself than work in groups.	2.14	1.50	2.00
4. I did not like the hands-on activities.	1.36	2.00	1.48
5. Compared to what we usually do in school, I liked this activity better.	4.71	4.17	3.91
6. I do not really like school.	2.29	1.83	1.52
7. This project is okay, but it does not really relate to me and my life.	2.07	2.00	2.00
8. Because of this project, I am more confident in my ability to do investigations.	3.93	3.83	3.74
Semantic Differential Items			
1. Boring … Exciting	1.79	2.00	1.83
2. Challenging … Too Easy	3.43	4.00	4.13
3. No Fun … Fun.	1.57	2.00	1.61
4. Worthwhile … Waste	4.43	3.50	4.30
5. Best … Worst	4.29	4.00	4.09

Table 1. Mean Ratings of Evaluation Items from the Two-Day Problem-Based Modeling Activity

The Likert-type items were rated by participants strongly agree (5 pts), agree (4 pts), undecided (3 ps), disagree (2 pts), or strongly disagree (1 pt). Therefore, a mean of 3 indicates undecided, while means greater than 3 indicate agreement and means less than 3 indicate disagreement. Semantic differential items were rated by participants closest to the word on the left (5 pts), closer to the word on the left (4 pts), undecided (3 pts), closer to the word on the right (2 pts), or closest to the word on the right (1 pt). Therefore, a mean of 3 indicates undecided, while means greater than 3 indicate preference for the word on the left and means less than 3 indicate preference for the word on the right.

The data for the Likert-type items in Table 1 indicate agreement with positively worded items and disagreement with negatively worded items. The strongest reactions were disagreement with item #4 and agreement with item #5. This indicates that participants *did* like the hands-on activities, and they liked the problem-based activity compared to what they usually do in school. Reactions to the semantic differential items indicate that participants thought the activity was exciting, challenging, fun, worthwhile, and the best.

In response to the open-ended question, "What did you like most about the activity?" participants' most common responses were working with others and learning about technology. In response to the open-ended question, "What did you like least about the activity?" responses were scattered but lack of prior knowledge and the short time frame were the most commonly mentioned. In response to the open-ended question, "What was your favorite part of the activity?" participants cited working with others, going outside, and learning about technology. In response to the open-ended question, "List something you learned in the activity," participants mentioned science content, information about the community, and technology. Finally, in response to the open-ended question, "List some words that describe how you feel about the activity?" the most commonly cited words in order of frequency were: fun, interesting, exciting, and worthwhile. The results suggest that participants had positive reactions toward the problem-based modeling activity while learning about science and technology.

The in-service professional development course that followed the initial modeling activity was designed to adhere to principles of good professional development practice. It was school-based; classes took place each Tuesday after school, a time that was generally convenient for participating teachers, in a computer laboratory/classroom in Crawfordsville High School. It took place over an extended period of time, a whole semester. This gave participating teachers the opportunity to practice what they learned and hence grow under the coaching and guidance from the university faculty and project staff. The emphasis in the course was on integrating technology for student learning, not on learning about technology devoid of context. The course was highly collaborative; most of the problem-centered activities throughout the semester involved teams of teachers working with one another. We hoped that this course collaboration would carry over into collaboration in the classroom when teachers implemented their own problem-based learning activities.

As a culminating activity in the course, teams of participating teachers developed their own problem-based learning units for implementation in the classroom during the spring of 2001. The components of these projects included: a driving question, curriculum objectives and links to curricular standards, possible student investigations and other activities, materials and resources, and assessment. The driving questions that were developed by the teachers to guide their projects were:

- Why should we care about deforestation of the rain forest? (interdisciplinary middle school unit)
- What makes the good life? (high school English, social studies, and elementary special education)
- What is conformity and how does conforming / not conforming affect our society? (high school English and music)
- What good is math and science? (high school mathematics and science)
- What makes something strong? (middle school technology and physical education)
- What would it take to live off planet Earth? (middle school interdisciplinary unit)

Websites describing the teachers' projects are available online at: http://research.soe.purdue.edu/challenge.

Conclusions

Problem- or project-based learning is a promising approach that involves students investigating complex problems in authentic contexts. Technology can play an important role in this process as a tool for gathering information, analyzing and representing data, and communicating results. How can teacher educators best prepare teachers to utilize this methodology in the classroom? This project utilized an approach that involved modeling problem-based learning via a realistic activity involving in-service teachers, pre-service teachers, and students. Evaluation data showed that teachers and students alike viewed this modeling activity positively. In a short period of time, this activity was able to convey the nature and components of problem-based learning to the participating teachers. Following this activity, a semester-long in-service course that was collaborative, school-based, and focused on integration introduced additional examples of problem-based learning and allowed participating teachers to build the conceptual and skills framework necessary to construct their own problem-based curricular units. This appears to be a promising approach for helping teachers to integrate problem-centered applications of technology in their own classrooms.

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Multimedia in the Classroom With PowerPoint and VBA

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Abstract: This paper describes the results of a pilot project to use PowerPoint and Visual Basic for Applications with a class of teachers taking Multimedia Design in the Classroom. Most participants in the class were enrolled in a masters program in Educational Technology and had completed Introduction to Educational Technology in which they learned basic multimedia functions of PowerPoint and HyperStudio. Few participants had more than beginner-level computer programming background but all were able to use and modify a limited number of Visual Basic for Applications tricks to create fully interactive multimedia projects.

Introduction

Interactive multimedia needs a mechanism to facilitate interactivity. Most basic tools, even modern word processors and spreadsheets, support the incorporation of a wide range of media, such as graphics, sound, and video. But few tools support interactivity, and of those, even fewer are within the reach of classroom teachers. Professional tools are cost-prohibitive, and many tools require technical skills that are beyond the level of even technology-savvy teachers. A graduate-level class in multimedia design that is geared to classroom teachers must strike a balance between sophisticated technology and accessibility; i.e., we want to stretch the teachers but not to the point that they cannot use in their own classrooms what they have learned.

PowerPoint is a tool that is widely available in schools because it is part of the Microsoft Office suite of tools. The basics of PowerPoint are very easy to use, and many teachers are already using PowerPoint in their classrooms. With the advent of PowerPoint 97/98 (and with little change in PowerPoint 2000), PowerPoint supports the basic tools of interactivity. PowerPoint slide shows no longer are limited to linear presentations. With buttons and hyperlinks, they can be full hypertext documents that provide links to multiple paths (Cavanaugh & Cavanaugh, 2000). This is a start, but it is not enough.

The true power of interactivity comes with scripting. Fortunately, PowerPoint comes with a sophisticated scripting language: Visual Basic for Applications (VBA). With VBA, the possibilities are endless. VBA is a complete object-oriented programming environment. VBA can provide interactivity with buttons, textual input, variable feedback, and much more.

"Wait!" I hear you cry. VBA is a sophisticated programming language. Can teachers become programmers? Certainly, many teachers can become programmers—and Galloway (1999) even argues that all teachers should have a foundation in programming—but the goal is not to create *programmers* but to create *scripters*. A programmer learns all the subtleties of a computer language in minute detail. A scripter might learn some of the details of the language but, more importantly, learns a few easily-modifiable scripts that can perform important tasks.

Scripting might not be a useful technique when used with a stand-alone programming language, but VBA can be built around PowerPoint. Content, media, and some basic interaction are already built into PowerPoint. Knowing a few simple VBA tricks, teachers can add more interactivity. By building the project around PowerPoint, teachers can use as much or as little VBA as their knowledge permits. Every VBA script is built on a framework of PowerPoint, so the basic structure of the project can be built with tools that all teachers can master easily.

This paper describes a pilot project to use VBA to enhance teacher-created PowerPoint projects in the context of a multimedia design class. The class consisted of teachers of various backgrounds, including: computer teachers, general elementary teachers, a middle school science teacher, a high school math teacher, a special education teacher, and a media specialist. Ten of thirteen of the teachers were enrolled in the class as part of a masters program in educational technology. The teachers were asked to report on their experience with computer programming when entering the class. On a scale of zero to five (with zero indicating no experience), none of the teachers reported above a three, and almost all teachers reported a zero or one.

The pilot project was set up to study the feasibility of this approach to a multimedia design class. The basic question was whether or not teachers could successfully learn enough VBA to add a significant level of interactivity to PowerPoint projects. The paper describes why the answer was "yes" in this case, and it describes the methods the class used to make this a successful experience for the teachers.

Multimedia Design in the Educational Technology Program

Multimedia Design in the Classroom is a required class for the Loyola College in Maryland masters program in Educational Technology (see http://www.loyola.edu/education/EdTech/). Additionally, it is used as an elective by other programs in the Education Department. The Educational Technology masters program is geared toward classroom teachers in the K-12 environment who are interested in expanding their use of information and communication technology within their own classrooms or becoming technology specialists on the school or district level.

Loyola College is currently undergoing review by the National Council for Accreditation of Teacher Education (NCATE). To this end, the masters program is aligned with International Society for Technology in Education (ISTE) Standards for Advanced Programs in Educational Computing and Technology Leadership. These ISTE standards are used by NCATE to judge advanced programs (any program beyond initial certification) in Educational Technology. Multimedia Design in the Classroom is largely responsible for addressing standard 4.2 (International Society for Technology in Education, 1996):

> 4.2 Instructional Design and Product Development.
>
> Candidates will evaluate authoring and programming environments for use in the classroom. They will apply instructional design principles to develop, implement, and test interactive multimedia instructional products using authoring environments.
>
> 4.2.1 use and apply more than one computer authoring and/or programming environment.
> 4.2.2 describe the characteristics and uses of current authoring environments and evaluate their appropriateness for classroom applications.
> 4.2.3 describe the characteristics and uses of current programming and scripting environments and evaluate their appropriateness for classroom use.
> 4.2.4 apply instructional design principles to the design of screens, text, graphics, audio, and video in instructional products under development.
> 4.2.5 describe and practice strategies for testing and evaluating instructional products designed.
> 4.2.6 apply instructional design principles to develop substantive interactive multimedia computer-based instructional products.

The goal of the class is to provide K-12 teachers with a firm grounding in multimedia development to create their own multimedia projects for use in their classrooms and to help their students create multimedia projects. Additionally, as per the ISTE guidelines, this class gives a basic introduction to instructional design principles. Since the goal of the masters program is not to create professional instructional designers or professional multimedia designers, the above ISTE guidelines can be met within the context of a one-semester class. However, the class covers a wide range of topics, so the appropriate selection of a textbook and supplementary materials is crucial.

Textbooks

Several textbooks provide a good foundation in Multimedia Design, including Ivers & Barron (1998) and Agnew, Kellerman, & Meyer (1996), which both concentrate on multimedia uses in the classroom. Ivers and Barron (1998) was chosen because of its strong emphasis on an instructional design model that easily can be applied to the classroom. While the text mentions specific technologies, including software and hardware tools, its strength is its emphasis on general principles of instructional design and multimedia design, and how these principles can be applied to the K-12 classroom. The next challenge was to supplement this text with material that can help the teachers use specific technology (in this case VBA) to create working projects.

This is a hands-on technology class in which teachers are not only required to understand general principles but also apply those principles to the design and development of a significant multimedia project. This left the dilemma of technical reference material for the programming/scripting/authoring environments used. As per ISTE standard 4.2.1 (see above), the class was required to "use and apply more than one computer authoring and/or programming environment" (International Society for Technology in Education, 1996). Previous versions of this class had used HyperStudio as the authoring environment with HyperLogo as the scripting language within HyperStudio. For this class, PowerPoint was added as an additional authoring environment with VBA used as the scripting language.

Reference books, at the level of the beginning programmer or scripter, are available for HyperLogo (see for example, Smith & Yoder, 1998; Lynn, 1995). However, no comparable books were available for VBA. VBA is a very sophisticated programming language, and reference books treat it as such (see for example, McFedries, 1999). HyperLogo is also a sophisticated programming language (which is based on the Lisp programming language used for artificial intelligence), but HyperStudio and HyperLogo were designed for schools and reference material has been developed that addresses the needs of teachers and students. Due to this gap in material for VBA, the author chose to develop his own supplementary material that brings the sophisticated power of VBA to a level that a classroom teacher can grasp without a background in computer programming.

This supplementary material, entitled *An Introductory and Oversimplified Guide to Using Visual Basic for Applications for Scripting PowerPoint Slideshows*, gave some background information but concentrated on specific practical applications of VBA for adding interactivity to PowerPoint. The next challenge was to create an environment in which teachers with differing technical backgrounds could learn from each other and learn to use a difficult technology (VBA) that was different from anything that most of them had ever used.

Partners and Templates

One premise of the class was that teachers would work together, if not throughout the entire class, at least when working on a significant final project. To this end, the first project (completed in class on the first day) was titled the *Pick-A-Partner PowerPoint Project*. This project served several purposes:

(1) It introduced some of the potential of PowerPoint as an interactive tool.
(2) It served as an icebreaker by allowing the teachers to meet each other using the technology.
(3) It introduced the concept of templates, an important concept in a multimedia design class.

All teachers in the class had some familiarity with PowerPoint. On the first day, the basics of PowerPoint were reviewed with careful attention being paid to incorporating media, buttons, and hyperlinks (to other places within a PowerPoint slide show and resources outside a PowerPoint slide show). These skills were then used to fill in the media and links in a PowerPoint template. The template included places for personal information, technical skills, and final project ideas. Although this was done at the very beginning of the semester, teachers were immediately encouraged to think about topics for final projects.

To start the second day of class, each teacher went through all the other projects. As they went through a project, they were asked for certain information, including their names, whether or not they were interested in working with the project's creator, and any project ideas they had. This information was added to the slide show in such a way that only the show's creator could access it. When everyone had gone through everyone else's slide show, each teacher returned to their own show to peruse the comments made by potential partners. This acted as an icebreaker and as a mechanism for choosing groups for final projects.

The power of this template project was not merely that the teachers only had to concentrate on the media and content. This, in itself, was a powerful introduction to the template concept. But even more powerful were features that were built into the template that the teachers could not, at that point, do themselves. All interactive features were added with VBA, providing a powerful example of the use of VBA in PowerPoint. The VBA code was made available to teachers and studied as part of the class.

Programming Concepts

VBA is a programming language. To fully understand it and take full advantage of it, one must understand basic programming concepts. While the goal of the class was not for teachers to fully understand VBA or take full advantage of it, introducing certain programming concepts was beneficial. This was always done in the context of performing a specific task. With the emphasis on scripting, the theme was *script first; ask questions later*. That is not to say that questions were not welcomed at any time, but that each VBA script that was introduced was introduced to either be useful in and of itself or with only minor modifications. Without understanding the programming concepts, teachers could use the script unchanged. Significant programming concepts, such as variables, loops, and if-then statements were then introduced as part of the working scripts. As teachers gained more knowledge about these concepts, they could modify the scripts to tailor them for their own purposes.

Some teachers left the class with only a vague understanding of key programming concepts. These teachers were only able to make minor modifications to scripts that were given to them. Others were able to grasp many programming concepts and were able to make significant modifications to scripts to do new and interesting things with VBA.

Simple Script Examples

The scripts that were introduced to the class started out simply. To start with, teachers put simple message boxes on the screen:

```
Sub SayHello()
   msgBox("Hello")
End Sub
```

This quickly advanced to scripts that could ask for user input:

```
Sub YourName()
   userName = InputBox(prompt:="Type your name", _
      Title:="Input Name")
End Sub
```

The input was then used in a message box:

```
Dim userName As String

Sub YourName()
   userName = InputBox(prompt:="Type your name", _
      Title:="Input Name")
End Sub

Sub DoingGreat()
   MsgBox("You are doing great, " & userName)
End Sub
```

Along the way, the concept of variables was discussed.

By tying YourName to a button on the first slide (possibly adding to that a simple script to advance to the next slide), the DoingGreat feedback could be placed anywhere in the slide show. This feedback would include the user's name.

With simple scripts, like the ones above, and more complex scripts that were introduced throughout the semester, teachers learned how to add objects (such as drawn shapes and text boxes) directly to PowerPoint slides, how to add slides, how to modify the text on a slide, how to keep track of right and wrong answers in a quiz, and how to provide feedback on a menu slide to indicate which topics had been visited by the user. All the while, issues of instructional design, graphical design, interface design, student-created multimedia projects, assessment, and much more were discussed.

Projects

Teachers demonstrated their skill with two VBA projects. The first project required the teachers to use a few of the VBA tricks they had learned. This was a technical project, where they were to show that they had mastered a few tricks. They had to include at least four tricks from this list:

- Student inputs a name which is used in feedback.
- Student answers some questions and is given feedback as to the number of correct answers.
- Objects are added to slides.
- Text is added to or modified on slides.
- Text color, font, size, or style is modified.
- A menu gives feedback as to what topics have been visited.
- Timed functions are used (with VBA, not standard PowerPoint timing).

For the most part, the VBA code for these tricks could be taken directly from class handouts. If this were a computer programming class, simply taking code from a handout would be discouraged. However, with the emphasis on scripting, mastering four or more of these tricks leaves a teacher with a limited but powerful set of tools to add interactivity to PowerPoint slide shows.

The final project was the most significant accomplishment for the class. Teachers worked alone or in groups of two, three, or four. In the final projects, teachers applied what they had learned about interactive multimedia and VBA to a significant educational project. Some groups chose to create templates for their students; other groups chose to create interactive projects that were complete, and others chose to do both. Teachers had a choice of using HyperStudio with HyperLogo or PowerPoint with VBA for their final projects. All groups chose PowerPoint because it was more accessible to them at home and in their schools and because the older version of HyperStudio we had available in class was not as stable as PowerPoint on the Windows platform.

Work on the final projects included discussions of how to create and assess a group project, instructional design, and storyboarding (a storyboard was required in advance for each final project). The class emphasized learning while doing and tying important concepts like these from the textbook to real projects.

In terms of VBA, the amount and complexity of VBA used varied from group to group. The goal was to have everyone comfortable with a few basic tricks. This was clearly demonstrated in the final projects as each group used at least a few basic tricks. More advanced teachers took VBA to the next level and were able to modify scripts used in class and write a few original scripts to create powerful interactive effects. The most common uses of VBA were for users to add their own feedback to a presentation and for quizzes.

For example, the *Canada* group created a template for their students about the provinces of Canada. They modeled their use of VBA after the Pick-A-Partner project. Each group of their elementary students would fill in the information about their chosen province into the teacher-created template. Other students would then have the opportunity to go through their slide show and give feedback about the information they learned about that province.

The *Economics* group created a project with several parts, including a tutorial and quiz for elementary students. The tutorial used VBA to keep track of menu selections, insuring that the students had visited all sections of the tutorial before proceeding to the quiz. The quiz used VBA to keep track of individual scores and provide feedback about numbers of right and wrong answers.

While these projects based their VBA on the tricks presented in class, the teachers expanded these tricks and demonstrated an ability to do a limited amount of original programming.

Conclusions

For the professional multimedia designer, PowerPoint is probably not the right choice. However expensive and complicated tools are not common in schools. Using PowerPoint as a framework, teachers are able to add as much or as little interactivity as their skills allow and their needs require. Thus, PowerPoint is an appropriate multimedia tool for teachers.

The goals of the Multimedia Design in the Classroom class included providing skills that teachers could use to create their own multimedia projects and provide skills to allow them to have their own students create multimedia projects. The first goal clearly was met. All teachers in the class were able to master a few basic VBA tricks that they could use to add true interactivity to their PowerPoint slide shows.

The second goal was partially met. The teachers learned to create multimedia projects that students could use. They also learned to create multimedia assignments in which their students could create multimedia projects. However, none were confident enough to try to get their students to script with VBA. The largest extent to which VBA would be used by these teachers' students was to fill in templates with VBA already scripted by the teacher. Perhaps as the teachers use VBA more on their own, they will gain the confidence to allow their students to create their own interactivity with VBA.

Overall, the class was a success. The emphasis on interactivity allowed teachers to think beyond media to make projects that engaged students and were more than page-turners with pictures.

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Reflections on the Impact of ICT on Teacher Education

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Abstract

> *"New ideas of any worth to be effective require a in-dept understanding and the development of skill and commitment to make them work"* (Fullan, 1993)

The attitude of the teacher has been identified as a crucial factor in the successful integration of ICT in education as has the role of teacher education. This paper reflects on the learning experiences of a group of teachers – two in particular - during the first year of a Masters programme in the area of ICT in education. Supported by data gathered from the class mailing list, video taped reflection, face-to-face interviews and informal discussion this paper focuses on how student-teacher attitudes to the role of technology, and perspectives on their own learning, changed over the course of the first year.

Background

The course in question is a masters degree in the area of IT in Education run jointly by the Departments of Computer Science and Education in Trinity College Dublin. The first two authors are students on the course the second two instructors. The stated aim of the course is to enable graduates "to play a leadership role in the area of IT in education". The degree is offered on a part-time basis over two years and is structured as a taught component followed by a substantive research dissertation leading to the degree of Master in Science.

The first cohort of twenty-eight students started in October 1999. Students were selected on the basis of academic qualifications, teaching experience and some by interview. They were characterised by a mixed ability skill set in terms of technical proficiency. Most of the students on the course were returning to formal education after many years. Assessment of student learning during the first year was via nine assignments, some done in groups, some done independently. Four assignments were given at the end of term one, four at the end of term two and one at the end of term three. The final assignment consisted of a capstone, or meta-assignment, and required a ten thousand-word dissertation and an IT artifact which was either a piece of educational multimedia or a website to present the findings of the *meta* research. A strong sense of community is one of the hallmarks of the class and students in the class refer to themselves as *mite99* after the name of the class mailing list mite-99 (Masters in IT in Education class intake 1999). The second intake are referred to as *mite00*.

The research reported here focuses particularly on three snapshots of the class taken in October 1999, June 2000 and October 2000. (It is from these sources that most of the student, and staff quotations, used in the rest of this paper are taken.) We attempt to identify positive and negative learning outcomes and how learning changed over time. The course aimed to provide an environment where students learned with and about technology and we explore how this changed not only the learning outcomes but also more fundamentally the learning process itself.

Summary of Findings

It was found that there was a marked contrast between the students' learning and the attitude to learning at undergraduate level and that on the Masters course. Overall the learning experience on the Masters was a more positive one than that at undergraduate level. The reasons for this are explored fully in the body of the paper but a contributing factor was certainly the smaller class size which allowed the development of interpersonal relationships among the entire class not possible at undergraduate level, where up to five hundred students took some courses.

As elaborated upon below the use of ICT had a significant effect. In particular the use of a simple asynchronous communication medium, i.e. a class e-mail list, contributed significantly to the development of a learning community as it allowed students to engage in anytime, anywhere communication with their peers and thus helped learning to take place in a scaffolded environment of peer support and support from lecturers.

Teaching strategies were significantly different from those at undergraduate level, where the didactic model was the norm. On the course the "lecturer as learner and learner as lecturer" model was the norm. This was evidenced through the use of video for lecturer self-analysis and reflection in an effort to learn more about teaching through and with ICT. Course lecturers acted as learners by auditing courses given by other lecturers. This allowed lecturers to experience the course as a learner and is typified by a remark made by one of the course lecturers on being interviewed as part of the reflection process at the end of the first year - *"I think I've learned more as a learner than a teacher".* Students often acted in the role of lecturer themselves by giving classes to their peers and to the lecturers. The group dynamics and the fact that a thriving learning community existed allowed students the confidence to do this. This confidence further allowed students on the course to make even greater strides in the fields of education and business. One student on the course is now currently lecturing on this year's first year intake, while two other students have left teaching and taken up jobs in ICT/Education companies. Still others have taken career breaks and become involved as researchers in the University's Center for Information Technology in Education (CRITE).

The body of this paper argues that different learning and teaching strategies facilitated by the use of Information and Communication Technology characterised this positive learning experience.

October 1999 Snapshot

At the outset the class were highly committed with one student commuting from a distance of over 200 km away twice, and sometimes three times, a week to attend lectures. There was a mixed ability skill-set among students in relation to technical proficiency. This proved daunting and some students felt intimidated by the high level of experience and skills of their peers. There were students who were familiar with Java programming or had completed degrees in computer science while others were just mastering Microsoft Word! Many students were returning to learning after a long period of time and were motivated to learn because of the commitment they had made in terms of time and money. There was a willingness to use new learning tools in the quest for IT knowledge. The high attendance at lab sessions was an indicator of this willingness. Students on the course, as educationalists and parents, wanted to equate their IT skills with those of their counterparts in the business world and with those of their own students and children. Both of these aspects emerged clearly when students introduced themselves to the class at the first lecture.

At this early stage one of the main problems experienced by students was the originality of the type of learning process. Students were faced with the prospect of engaging with new technology, not just the internet but MOOs (Multi User Object Oriented), MUDs (Multi User Domains), SMART boards, digital video etc. More fundamentally students were faced with new types of learning involving collaboration, communication, presentation, publication, sharing and above all reflection on their own work and learning process. For most it was a new way of learning which was initially frightening, and off-putting, and there was some reluctance on the part of students to engage with this new methodology.

> *"We were exposed to completely different ways (of learning)."*
>
> *"We were coming from this drastically different learning environment to this new learning environment which was totally alien. I was frustrated by it."*

This reluctance was exemplified at the beginning of the year when it was noted that there was very little engagement in the *mite99* e-mail list. In October 1999 there were approximately eleven e-mails sent and these came mainly from the lecturers. This stood in marked contrast to October 2000 when forty nine e-mails were posted. This was also shown in students' lack of enthusiasm with regard to the use of digital video in first term assignments.

This reluctance to engage with this new type of learning was further exemplified by the lack of participation in the an online debate which the class was invited to participate in. Students were required to obtain a login name and password by filling in an online form and submitting it to the debate organisers. It was a course requirement that students participate, however only 15% of the class did so. When the class was queried as to why they thought the participation rate was so low some responded that the debate took place on a Saturday and they wisely (in their opinion) chose to remain in bed! More seriously it was remarked that this type of activity was too daunting and ambitious for those who had little or no experience of using the Internet, in particular engaging in online debate with people who had done so before.

One particular lecture in October 1999, introduced the concept of MOOs. Students had no prior knowledge of using MOOs for learning and it was introduced without much scaffolding. Instead the focus was on discovery learning which as not well received at this point in the year. It was later discovered that the reason for this was because students did not fully understand the meaning of the task or the concept of MOOs. Students became increasingly confused and their desired learning outcomes were not achieved. Reference to a log of this particular MOO session is testament to this. There were lots of jokes and chit chat unrelated to the lesson objectives with the reflective comments being of the form *"These (MOOs) are dumb"*.

June Snapshot

At this stage of the year students had completed the taught component and were completing their end of year capstone, or *meta*, project. As was to be expected the quality of the contents, and production, of assignments was of course higher than that found during the year[1]. By now students were using more sophisticated tools and experimenting with programming. Netscape Composer, so highly prized in the first term, was left for dust with students using tools such as Dreamweaver or Flash to produce their artifacts which ranged from presentation of research assignments in the form of websites to the development of educational software.

June also witnessed the development of higher expectations and motivation to continue experiencing success on the part of students. This was borne out by a readiness to become involved in ICT related projects outside the realm of the course. In particular some students became involved in research projects being carried out by CRITE which led to one student from the course sharing a stage at a confernce in Dublin with Nicholas Negroponte, the Director of MIT's Media Lab. Motivation and commitment was also borne out by students initiative to learn the Dreamweaver package even though it was not taught on the course. This was done through peer tutorage and independent learning. By August the motivation had still not waned and many students embarked on commercial courses to further develop their web authoring skills.

There was far greater participation in online discussions at this stage with over 90% being active participants . Many of the emails at this point expressed support and sympathy because of the stress and strain being experienced by students in relation to the *meta* assignment. (*"Don't mention the meta"* was a common response to queries about work in progress.) The email list offered an important support structure to students, particularly at this stressful time. "*Keep up the good work*" and "*Nearly there*" were common messages to the list. "*Where's the barbecue happening*" was the question on everyone's lips after the "*meta madness*" had ended!

There was a willingness to share resources both in class and online particularly because the *meta* assignment was proving so time consuming and stressful. People used the class mail list to share resources, found online, with fellow students. As soon as someone learned a new skill it was passed on to the class, the mastery of digital video editing being a case in point. Books, journals and feedback on individual assignments were offered. Most students felt more confident and had better self esteem. This resulted in even more access to assignments and work in progress as people wanted to share and reflect and had the confidence to do so in a safe learning environment.

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[1] So high in fact was the standard that the external remarked that many of the Meta assignments were the equivalent of Masters dissertations, such was the amount of work that had gone into them.

October 2000 Snapshot

At the start of the second year of the program a number of career changes took place among the original cohort. The first two authors had left formal teaching and embarked on new career paths. Others had extended career breaks to focus on research, while others are considering the possibility of pursuing PhD degrees. Most interestingly, a number of the original cohort are now engaged in lecturing course modules to the first year students.

Enthusiasm has not waned, evidenced by the fact that more than half of the *mite99* class turned up on the first night of lectures for *mite00*, to welcome the new class and share their experiences of learning over the past year. It was remarked by *mite00* students and one of the lecturers that the enthusiasm and motivation of *mite99* was an inspiration to *mite00*. Immediately a system of mentoring was fostered between the *mite99* class and the new incoming class. ICT facilitates this process as the main communication method is via email. A sharing of resources and assignments has also begun to emerge. Data from the *mite00* web discussion reveals that the new intake are experiencing the same fears and anxieties as their predecessors.

> *"I feel overwhelmed with unfinished tasks & wonder when I will post the uncompleted strands - which are now on Floppy disc. While many of my peers appear to achieve this, my difficulty is not getting set tasks completed on the given night".*
>
> *"I feel that I am lacking in technical ability compared to some people on the course".*

It is our intention to map the impact ICT has on the learning of this group and to compare it with the ongoing reflections of the *mite99* group. We hope to monitor the interaction between the two groups with particular emphasis on the use of email list facilitates and a virtual learning environment.

A New Type of Learning & The Role of ICT

As argued in (Margaret Riel and Kathleen Fulton, 1998) computer technology can be viewed as an effective vehicle *"to transform classroom learning into learning communities with students, teachers and community members all playing a vital role in directing the course of education."* The experiences described here exemplify this type of learning model with its emphasis on collaborative group based learning, lecturer as learner and learner as teacher, as alluded to earlier. Electronic communication, peer tutoring etc. have contributed to the development of a community of learners in which learning flourishs in a non- threatening, supportive environment. Learning at undergraduate level was the antithesis of this experience. It stressed isolated, competitive endeavor in an environment where failure was not a valued learning experience.

The students' own perceptions on how ICT has impacted on their learning experiences are informative. Initially many students began the course with the perception of ICT as a 'scary' subject, e.g. *" I was afraid to be left alone in a room with the computer for fear it might blow up". "I don't know the first thing about technology. I am hearing words like operating system, ftp, ASDL, broadband and I haven't a clue what they mean!"* while some were even unconvinced as to the value of ICTs in education. *"I don't see what a computer can do that a blackboard and chalk can't, and with far less hassle."* In addition, many students had little experience of integrating ICT into the curriculum. *"I have never used a computer with my students before. Number one, I have never had the opportunity and number two I would not know how to".*

Students found however that their perceptions changed when they experienced success in learning and grew more confident in using ICT as a learning tool themselves. *"We can see how children can benefit from our experience and that's been very motivating".* Student fear of ICT and group work was overcome by experiencing early success in learning through and about ICTs. *" I remember when fellow students arrived at my house to do the first assignment. I was terrified. I had never worked in a group before where I shared my work with others and displayed it for them to comment on!" "Having received a good grade and enjoyed the experience of working collaboratively I was ready to do so again but this time without the anxiety"* (A positive view towards ICT is not universally shared. *"I felt there was no reward because by* *the time I had finished coming to terms with the technology I was so exhausted that I couldn't enjoy the success".)*

Early success was crucial to the development of a positive attitude to ICTs and being motivated to continue learning. The course created a range of learning opportunities and environments, which addressed the needs of multiple intelligences and provided a framework for successful learning outcomes. Riel & Fulton (1998) argue that people of multiple intelligences working collaboratively makes a learning community interdependent i.e develops peoples strengths and competencies which leads to empowerment. " *I really felt that we brought out the best in each other*" one student said about collaborative learning.

A particularly interesting observation on the course to date is that students with a moderately successful experience of learning at undergraduate level are achieving higher results than many of their peers who excelled in the traditional undergraduate and even postgraduate system. Many factors may be contributing to this but one possibility is that those who are most dissatisfied with the traditional learning paradigm may feel more motivated to fully embrace a new learning environment characterized by self-direction, collaborative learning, peer tutoring and experimentation with new technology.

Motivation, combined with competence and confidence in learning with and about ICT led to increasingly successful learning outcomes as the course progressed. This development of competency in ICT was invaluable in motivating students to become involved in the transfer of learning to the global community. This was evident when an interest emerged among *mite99* students in participating in conferences and projects outside the realm of the course. Fullan (1998) views this "connection with the wider environment as being critical'' to successful learning.

A steep learning curve was recorded during the course. Students' learning began with Netscape Composer and PowerPoint progressing to Macromedia Flash, Dreamweaver and Java Script. Research, presentation (both orally and written), communication and collaboration skills were enhanced. Keeping pace with regular changes in technology necessitates lifelong learning. A specific example of this related to the constant revisions of software and applications used on the course. In particular web-authoring tools changed at a rapid pace.

Finally and perhaps most importantly the students stressed the importance of reflection in the learning process and how ICT facilitates this. Students revisited assignments and used their reflections as a catalyst to construct new learning situations. ICT enabled this process by facilitating rapid revision and review of learning. For example the use of video allowed immediate review of reflections on learning and thus the reflection became an integral part of the learning process itself.

Summary

This paper has briefly explored some of the reflections of students on the affect that ICT and broadly collaborative, or social constructivist, approaches to learning have had upon their own their own learning. The reflections are for the most part very positive. It is still however early days and we aim to continue to monitor and reflect upon the learning experience as we endeavor to construct knowledge on how to learn with ICTs.

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Instructional Staff Development Project: A Pre-Post-Post Follow-up Evaluation

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Abstract: The second year of the professional development project was designed to facilitate the integration of instructional technology in the classroom. Twenty-five teachers in grades 3-5, from 9 different schools, participated. The project consisted of four workshop modules on technological training and five modules on development of interdisciplinary thematic units for integrating materials to achieve the Mathematics, Science and Technology, and English Language Arts New York State Learning Standards. Effectiveness of the project was determined by giving all participants a General Pre-test to determine baseline measures for each of the aspects of the Project and a General Post-test. In addition, participants in the original project were contacted one year later and were given a General Post Follow-up measure. Results indicated that the both years of the project was highly successful. The Post Follow-up showed that the positive changes achieved during the first year, endured one year later.

Introduction

The original Targeted Instructional Staff Development Project took place during the spring semester of 1999. Its major purpose was to facilitate integration of technology in the classroom. The ultimate goals were: to empower students to use technology in all phases of their education, to facilitate teachers as learners, and to achieve the New York State Learning Standards in Mathematics, Science and Technology, and English Language Arts, and to facilitate integration technology into the curriculum. The one-semester project consisted of nine separate workshop modules.

The Targeted Staff Development Project was renewed for the 1999-2000 academic year. In the second phase of the project, seventeen teachers from six different school districts participated in seven workshop modules. Four of the modules were specifically designed to facilitate integration of technology into the classroom.

The purpose of this paper is to describe the evaluation procedures used to determine the effectiveness of both phases of the project. A review of the literature suggests that the major limitation of evaluation research is the research design employed. In 1997, Bauder, Carr, Mullick & Sarner reviewed research techniques employed in evaluating effectiveness of programs and found that few employed sound research designs. As a result, the authors developed a set of guidelines for researchers that were adopted for the current study.

A pre-post test design was employed. This design is particularly appropriate for assessing both formative and summative information. Because each subject acts as his/her own control it minimizes any random influences of extraneous factors and determines the effects of the project on changes between pre and post-measures.

Previous research by Ely (1990) and Bauder (1993) has shown that there are a number of conditions that facilitate or impede implementation of educational technology. Questions were included in the questionnaires to determine if changes of perceived barriers to integration of educational technology into the curriculum occurred as a result of participating in the project.

The Evaluation of the Project

The participants in both phases of the project were given a general pre-test to determine baseline measures for each of the aspects of the project. Upon completion of the workshop modules, a general post-test, consisting of many of the same items, was administered for both phases of the project. These questionnaires provided summative information regarding the overall impact of the various modules on teachers' responses. Pre-test and post-test questionnaires were also administered for each of the individual modules. These results were used for formative information to refine or modify the procedures and information being presented in each of the modules, if required. A post-follow-up questionnaire was also administered to the participants of the first phase of the project. Only the results of the general pre and post-tests and the post-follow-up test are considered in this paper.

The Questionnaires

The pre and post questionnaires had four common parts. Part I examined frequency of use of hardware and software, perceived importance of these technological aspects in achieving the New York State Learning Standards, and the teachers' degree of comfort in using each of the items. Part II examined teachers' experience with technology including the use of technology in the classroom and the specific activities for which students used technology. Part III examined the extent to which teachers integrated technology into the classroom and Part IV tapped teachers' perceptions of barriers that impeded integration of technology into their classroom instruction. The post-test included a final section that asked teachers to rate each of the modules on three dimensions. These responses provided an overall summary of the teachers' experiences throughout the project.

Results

Pre-Post Changes to Determine the Effectiveness of the Development Modules

Part I : Frequency of Use and Degree of Comfort Working with Hardware and Software

For summary purposes, total indexes were developed for both phases of the project and for the post-follow-up by summing the ratings for the subsets of items related to frequency of use of hardware, frequency of use of software, comfort in using hardware and comfort in using software. The average scores for each Total Index is displayed in Table 1. In both instances, teachers rated the items higher on the post-test than on the pre-test. The only exception was average comfort in using the hardware items in Phase I. The average on the pre-test (52.00) was higher than on the post-test (49.96).

		Mean Pre-test Phase I	**Mean Post-test Phase I**	**Mean Post Follow-up Phase I**	**Mean Pre-test Phase II**	**Mean Post-test Phase II**
Frequency of use of	Hardware	32.09	47.87	32.50	33.73	41.60
	Software	47.22	69.87	62.47	49.40	76.93
Comfort in using	Hardware	59.48	49.96	51.13	60.40	76.93
	Software	52.00	84.30	79.47	56.27	91.93

Table 1: Mean scores for the indexes for total frequency of use and total comfort for hardware and software items in both phases of the project.

An analysis of variance for repeated measures using overall indexes from the pre-test, post-test and post-follow-up as the within-subjects variables for Phase I was conducted. The results of the analysis for Total Index of frequency of use of hardware and Total Index of comfort with hardware yielded one non-significant results (see rows 1 and 3 columns 3 through5). This finding is not surprising in light of the fact that teachers continue to use the hardware they used previously. However, significant F values were found for Total Index of frequency of use of software (F = 6.72, df = 2,28) and Total Index of comfort in using software (F = 16.51, df = 2,28). Post-hoc comparisons indicate that the pre-test scores are significantly less positive than both the post-test and the post follow-up while the post-test and post follow-up scores did not differ significantly. Taken together, these results suggest that positive changes occurred as a result of participating in Phase I of the project, and remained positive even after a year had elapsed.

To examine the data for Phase II more fully, t-tests for dependent (paired) samples were performed to compare changes in the Total Indexes to determine whether or not significant changes in teachers' responses occurred as a result of their participation in Phase II of the project. The findings from the analyses of the t-tests for the Total Index for frequency and Total Index for comfort of use of hardware and software are displayed in Table 2.

Post test – Pre test for Phase II	**Mean differences**	**t**	**df**	**Sig. (2-tailed)**
Total frequency of use of hardware	7.87	2.07	14	.057
Total frequency of use of software	27.53	3.52	14	.003**
Total comfort of using hardware	5.07	.52	14	.613
Total comfort of using software	35.67	4.15	14	.001**

***** p <.01***

Table 2: Summary of the t-tests for dependent samples on changes in total index for frequency of use and total index for comfort in using hardware and software for Phase II.

An examination of column 5 in Table2 shows that two of the analyses yielded significant changes from pre to post testing. Rows 2 and 4 show that frequency and comfort ratings for using software were significantly higher at the completion of the project than at its onset. However, two of the t-test failed to achieve significance. No significant changes occurred in the teachers' overall ratings of frequency of use of hardware or level of comfort in using the hardware at the end of Phase II of the project. This finding is not surprising in light of the fact that the types of hardware used tended to be the same types that teachers reported having experience with prior to the project. It appears as though the frequency and comfort levels in reference to hardware were not impacted by participating in Phase II of the project.

Part II: Changes in Experience with Integrating Computing into the Classroom

Teachers were asked to rate their experiences in dealing with technology in the classroom. For Phase I of the project, teachers responses yielded a pre-test mean total index of 42.40, a post-test mean total index of 59.47 and a post-follow-up mean total index of 61.73. A repeated measures analysis of variance on the total index for use in the classroom achieved significance. The post-hoc test indicated that the significant difference was caused by the lower scores on the pre-test while no significant differences occurred between the post and the post-follow up evaluation. These results show that teachers tended to integrate computing into the classroom significantly more after participating in Phase I of the project. In addition, these significant changes endured one year later.

Changes in responses to items dealing with experiences involving technology in the classroom for participants of Phase II of the project yielded similar pattern of results. The results of the series of t-tests

Post test – Pre test for Phase II	Mean Differences	t	df	Sig. (2-tailed)
Fully Integrate technology into instruction	2.67	4.34	14	.001**
Integrate technology into specific units	2.27	4.21	14	.001**
Guide students in use of technology	1.93	2.64	14	.020**
Accommodate different levels of expertise	1.47	1.79	14	.096
Relate Technology to curriculum objectives	2.67	4.51	14	.000**
Relate Technology to student achievement	2.80	4.98	14	.000**
Prepare materials for student management	2.87	43.62	14	.003**
Prepare classroom materials for students	3.07	4.51	14	.000**

** *p* < *.01*

Table 3: T-tests for dependent groups on items related to experience with technology for Phase II.

for dependent samples examining these changes are displayed in Table 3. An examination of the last column of Table 3 shows that all but one of the t-test achieved significance. These results indicate that teachers believed they were better able to implement technology into their curriculum at the completion of project. The responses on the post-test of Phase II were significantly more positive than on the pre-test. Taken together, these findings show that participating in Phase II of the project did have a positive impact. Upon completion of the project, teachers believed that they were better able to integrate technology into their curriculum and into specific units, and to guide students in the use of technology. In addition, teachers were better able to relate technology to curriculum objectives and to student achievement. Finally, the teachers indicated that upon completion of the project, they felt more confident in developing materials for student management using instructional technology and in preparing materials to be used by students in the classroom. However, Table 3 also shows that teachers did not feel that they were better able to accommodate to different levels of student expertise, even after participating in the project. It may be that more practice and time to integrate learning into the teacher's own experience is required before they feel that they are able to use the knowledge in a flexible manner.

Part III: A Comparison of Perceptions of Teachers use of Computers in the Classroom Compared to Students.

Part III of the pre and post-tests obtained during Phase II of the project compared teachers' perceptions of frequency of various activities involving the use of technology in the classroom by the teachers themselves and by their students. Teachers believed they used computers more frequently compared to their students for organizing and storing information, for e-mail and for retrieving information from the Web. However, no significant differences were perceived between teacher and student use on text editing, creating non-visual graphics, performing calculations, and performing any of the Web related activities. In examining the ratings on each of these individual items it becomes clear that no differences occurred for one of two reasons. Teachers tended to see their level of use of computers for text editing, to support individualized learning and for remediation as similarly high. Mean ratings for these items ranged from 7.7 to 6.5 on a nine-point scale. However, teachers perceived activities associated with the development of Web pages and performing calculations as equally low for both themselves and their students.

Part IV: Changes in Perceptions of Barriers to Integrating Technology into the Curriculum.

Part IV of the post-tests was designed to re-examine the teacher's perceptions of some of Ely's (1990) and Bauder's (1993) factors that impede their ability to integrate technology into the classroom. Results from Phase I of the project indicated that teacher's perceptions of degree of impediment of integration of technology into the classroom significantly decreased for all but one perceived barrier. A Total Index of Perceived Barriers was also developed and was used as the dependent measure for a repeated measures analysis of variance for the three time periods of Phase I. The mean Total Index for Perceived Barriers was 71.13 for the Phase I Pre-test, 63.07 for the Phase I Post-test and 39.47 for the

Phase I Post-Follow up. The significant F value of 7.74, df = 2,28, $p = .002$, shows that the ratings changed over the time periods. The post-hoc test indicated that teachers perceived the factors as significant impediments to integrating technology into the curriculum prior to participating in the project. In addition, the perceptions of degree of impediment on the post-test were significantly higher than on the post-follow-up. One explanation for this continued reduction in perceived impediments over the three time periods is that as teachers continue to work with the hardware and software and gain additional confidence, external factors are perceived as less of an impediment to integrating technology into the curriculum.

T-tests for dependent samples were performed to examine whether or not changes in perceptions occurred during Phase II of the project. The results of these analyses displayed in Table 4 show the same pattern of results as was found during Phase I. Teacher's perceptions of the extent to which the factors act as impediments to integrating technology into the curriculum significantly decreased after participating in Phase II of the Targeted Staff Development Project.

Perceived barrier Post – Pre test for Phase II	**Mean Difference**	**t**	**df**	**Sig.(2-tailed)**
Not enough or limited access to computer hardware	5.40	7.84	14	.000**
Not enough computer software	4.80	7.48	14	.000**
Lack of time in school schedule for projects involving technology	4.13	4.74	14	.000**
Use of technology not integrated into curriculum documents	3.53	5.66	14	.000**
Not enough teacher training opportunities for technology projects	4.27	6.04	14	.000**
Technology integration is not a school priority	.67	.856	14	.406
Difficulty in finding substitutes in order for teachers to attend training	4.07	7.68	14	.000**
Lack of technical support	3.67	5.08	14.	.000**
Lack of instructional support	2.27	2.98	14	.010**
Lack of other supporting materials	3.60	5.78	14	.000**
Total Index for Perceived barriers	38.87	9.22	14	.000**

***** $p < .01$, * $p < .05$***

Table 4: Changes in perceived barriers after completion of Phase II of the project.

Part V: Overall Evaluation of Each of the Modules of the Project:

In order to obtain summative information for the impact of each of these individual modules, rather than reporting the analyses of each individual module, the last part of the Post-test asked teachers to evaluate each of the models by: giving an overall favorability rating to each, indicating the extent to which they believe that each Module would be beneficial in achieving the NY State Learning Standards and indicating the extent to which they expected to apply information from each of the modules in their future classes. These responses provide an overall summary of the teachers' experiences throughout the project.

The results of the analyses show that teachers had a favorable impression for each of the modules for both Phase I and Phase II of the project. On a nine-point scale where a rating of 9 indicates high favorability, the average rating ranged from 6.48 to 7.88 on modules in Phase I and from 6.00 to 8.00 on modules in Phase II. The average ratings of the extent to which teachers' believed each of the modules would help to achieve the NY State Learning Standards were also highly favorable with mean ratings ranging from 5.84 to 7.6 on Phase I and 6.00 and 7.87 on Phase II. Ratings of the extent to which the teachers expected to apply information from each module in their future classes showed a similar pattern of results. The mean rating for each module ranged from 6.4 to 8.0 on Phase I and from 6.0 to 7.93 on Phase II.

An analysis of variance for repeated measures using teachers' overall ratings for the eight modules as the within-subjects variable, failed to achieve significance on all three of the sets of ratings. These findings indicate that teachers' overall ratings of the modules were not significantly different from one another and tended to be consistently high.

Conclusions:

The results clearly indicate that both phases of the Targeted Instructional Staff Development Project were highly successful. There were three major sets of findings. First, the teachers' responses for both phases indicate that as a result of participating in the project they were using software more frequently in their classrooms than they had prior to the project. It is interesting to note, however, that there were no changes in frequency or comfort of using hardware. It appears as though the project required teachers to use only the types of hardware with which they already had experience and felt relatively comfortable in using. Second, teachers believe that these activities helped them to learn new ways to integrate technology in the classroom and they felt more confident in using technology themselves and in guiding their students in the use of technology at the completion of the project. The third major set of findings showed significant change in perceived barriers to the integration of technology in the classroom. Factors that had been perceived as barriers prior to participating were seen as significantly less of an impediment as teachers gained new experience and knowledge about technology and learned new strategies for integrating technology into their curricula. This finding is particularly interesting since few of the activities within the project addressed the perceived barriers directly. The one year post-follow-up of teachers who had participated in Phase I of the project indicated that the significant changes that resulted from participating in the project maintained one year later.

Participants did identify several limitations of the project in their post-test comments. Specifically teachers felt that the activities were too concentrated and there was too little time to deal with the material adequately. They also indicated that a severe limitation to integrating technology in the classroom is the lack of technical support when they returned to their schools. Future projects should therefore attempt to address these difficulties.

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When Attitudes Change, Do Changes in Practice Follow?

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Abstract: In order to meet the challenge of teacher education responsive to the integration of the newer electronic technologies, the Integrating Technology in Schools (ITS) Program leading to a Masters of Education in Curriculum and Instruction was developed. The ITS Program is structured around a cohort process that supports students finding common ground around a shared set of experiences, knowledge, readings, activities, and support systems. This paper presents a summary of data obtained during the 1999-2000 ITS Program and examines 1.) changes in participants' stages of concern, 2.) changes in participants' self-reported frequency of technology use, 3.) changes in participants' self-report concerning collegial interactions, 4.) changes in participants' summary of assigned technology use in their classrooms, and 5.) conversations with participants. Examining these changes enabled the authors to discuss the relationship between changes in attitude and classroom practice.

Failure to incorporate technology into the schools is frequently placed on the classroom teacher. Yet, this failure does not belong with the classroom teacher alone or even with the technology itself. Teachers' use of technology often forces it into traditional teaching paradigms that have existed for decades. Teachers and educational reformers rarely recognize that innovative uses of technology require a revision of educational practice if technology is to impact the American education system. Schubert (1986, p. 371), for instance, asserts that the professional educator is "the most salient force in the curriculum improvement process" and that the most important aspect of curriculum development is professional development. He states that for inservice teachers, graduate programs need to focus on the needs of teachers as well as be cohesive and integrated. Such programs should be oriented toward the utilization of research and practical knowledge and take into account the experiences of teachers. Graduate level teachers must be supported in learning that a "teacher is a leader from within, not a dictator (no matter how benevolent) from without" (Doll, 1993, p. 168).

Meeting the Challenge: The ITS Program

In order to meet the challenge of teacher education responsive to the integration of the newer electronic technologies, the Integrating Technology in Schools (ITS) Program leading to a Masters of Education in Curriculum and Instruction was developed. The ITS Program is structured around a cohort process that supports students finding common ground around a shared set of experiences, knowledge, readings, activities, and support systems. Each group shares a common area of inquiry – one that centers on models, methods, and processes that support the incorporation of technology into educational practice. As teachers enter the Program, their most pressing goals center on learning to use the newer electronic technologies. Participation in the ITS Program, however, leads not only to technological expertise but to a consideration of the social, cultural, political, and epistemological impacts of these technologies. Participants are encouraged to wrestle not only with how to use these technologies but also with their meaning for the practice of education (Norton, 1994).

Since its inception, the impact of the ITS Program on the attitudes of participants has been repeatedly studied. Sprague (1995), for instance, used an ex post facto survey/interview design to investigate the effects of the ITS Program on participants' self-reported use of a variety of instructional strategies as well as their stages of concern related to the integration of technology as a change or innovation. She reported a significantly higher self-reported use of technology in their classroom for ITS participants over a control group. Additionally, those who had completed the ITS Program expressed concerns related to understanding the consequences of technology and collaborating with peers related to the integration of technology as opposed to higher concerns among the control group about basic awareness and information. Norton & Sprague (1996) reported similar changes. Using a pre/post design, they reported that ITS participants significantly changed their perceptions of the role of technology to support teaching and learning as well as shifting from awareness and information concerns to concerns related to consequences and collaboration. In addition, open-ended questions revealed a self-reported increase in leadership activities related to technology integration.

Examining the Relationship between Attitudes and Practice

Research suggests that the ITS Program plays a significant role in attitude. Yet, no data exists to examine the impact of the Program on actual classroom practices of participants beyond those self-reported on surveys. In the past, collecting such data was difficult because of the unpredictable nature of access to technology. In the early years of the ITS Program, many participants had no access to technology. In later years, many teachers were limited to computer labs in their schools with difficulties in regular or sustained access to these resources. Because of these irregular and unpredictable access problems, it was difficult to assess the relationship between attitude changes reported on surveys and actual classroom practice. In August, 1999, a group of 24 teachers began their participation in the ITS Program. Unlike any previous group, this group of teachers was teaching in a school district that had implemented a major technology initiative. ITS participants were teaching in schools where all classrooms had four, Internet connected computers. *The time had come to ask the question: when attitudes change, do changes in practice follow?*

Of the 24 original participants, all remained in the program. At the beginning of the program, four of the participants were assigned to schools as Technology Resource Teachers (TRTs). A fifth participant assumed this role during the course of the program. In addition, two participants were specialty area teachers – one in art education and one in music education. These seven teachers were eliminated from the research pool because they did not have regular, sustained classroom responsibilities. Thus, the final subjects for this study were 17 classroom teachers. Seven participants were elementary classroom teachers; four were middle school classroom teachers; and six were high school teachers. The subjects' averaged 12.3 years teaching experience, ranging from 1 to 28 years.

In order to answer the question – when attitudes change, do changes in practice follow, a pre/post survey was administered to the 1999-2000 participants. The pre survey was administered at the group's first meeting in August, 1999. The post survey was administered 10 weeks before completion of the Program in October, 2000. The survey was divided into two parts. The first part asked about frequency of technology use and the frequency of collegial interactions related to technology planning. The second part of the survey asked participants to complete the Stages of Concern Questionnaire (Hall, George, and Rutherford, 1998). A third section was added to the post survey asking two open-ended questions: what are obstacles you experience in using computers to support teaching and learning and what are some of the enabling things that support you in using computers to support teaching and learning. Finally, participants were asked to summarize assigned classroom use of computers each Friday for two four-week periods. These teacher summaries were collected during a four-week period in October, 1999 and again in October, 2000.

Changes in Attitude: The Stages of Concern Questionnaire

Participants' responses to the thirty-five items on the pre and post Stages of Concern Questionnaire (SoCQ) were grouped by relevant stage, totaled and converted to percentile scores using guidelines in the SoCQ manual. The stage reflecting the highest percentile score for each participant was identified. The stages of highest concern are presented in Table 1, and averaged percentile scores for the group are presented in Figure 1. Upon beginning the ITS Program, the largest number of participants expressed personal concerns followed by those participants who expressed information needs. In addition, expressed concerns about consequences for students, collaboration with peers, and refocusing were lower. This profile illustrates normal, interested nonusers who are somewhat aware of and concerned about the role of classroom computers integrated with teaching and learning. This would be an expected profile for those entering the ITS Program. Post survey scores indicate unchanged awareness, information, and personal concerns as well as demonstrating increased concerns relevant to consequences for students, collaboration with others and refocusing, that is, concerns that reflect ideas about seeing their ideas put into practice, tried out, or ideas to improve the use of classroom computers to support teaching and learning. As demonstrated in the figure reflecting group percentile score averages, this pattern holds true for the group as well as for individuals.

	Stage 0 Awareness	Stage 1 Information	Stage 2 Personal	Stage 3 Management	Stage 4 Consequences	Stage 5 Collaboration	Stage 6 Refocusing
Pre Survey	1	3	7	2	1	2	1
Post Survey	0	0	2	1	0	10	4

Table 1. Highest Stage of Concern by Number of

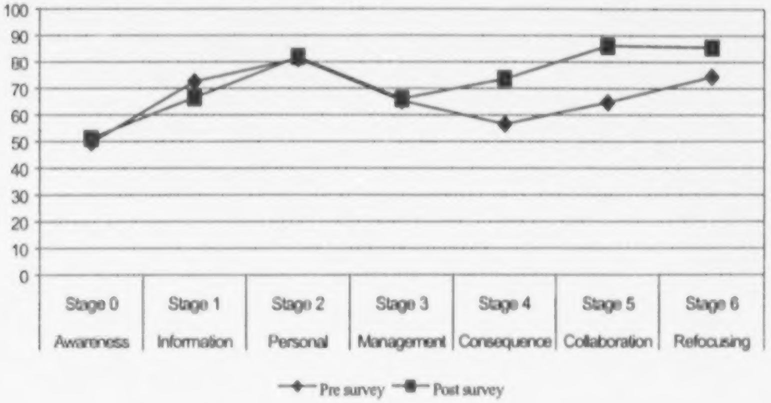

Figure 1. Average Group Percentile Scores by Stage of Concern

It is clear that the concerns of participants changed over the course of the ITS Program. Intuitively, one would expect awareness, information, and personal concerns to lower as participants shift from a nonuser to a user profile. However, it is not uncommon for the Stage 0 concerns of established users to rise. Experienced users tend be more concerned about other things in their lives. Examining the individual Stage 0 items may identify one reason for this. Item 21, for example, which was rate as "somewhat true of me" by all participants, states "I am completely occupied with other things." Individuals who are more experienced, comfortable, and confident users tend to shift their concerns to other aspects. They therefore report very directly that things other than integrating technology with teaching and learning are of concern to them. After looking at self-reported use of technology, participants' logs of assigned computer activities, and conversations with participants, we will return to discuss what might have replaced integrating technology in schools as a concern.

Changes in Practice

Participants' Self-Reported Use of Computers

To determine if participants' changes in concerns were reflected in their use of classroom computers, the first part of the survey asked participants to respond to four questions: 1.) student use of a variety of computer applications, 2.) frequency of discussion with other teachers, 3.) student use of computers, and 4.) primary goal for classroom computer use. Results from the questionnaire are reported in Table 2. As reported in the table, self-reported use of a variety of applications shows a consistent shift toward more frequent use. There are, however, several notable exceptions. At the beginning of their program, 70 per cent of the participants reported frequent use of word processing. On the post survey, this declined to 39 percent with a rise to 46 per cent from 12 per cent in the occasional category. Similar shifts can be noted for use of the Internet and for the Other category. While not inherent in the raw data, it is likely that two factors influenced this shift. One, participants became more aware of and able to use a larger variety of applications and, thus, were not dependent on one or two applications. Second, participants became more realistic about the benefits and limitations of particular applications and their role in supporting teaching and learning.

Participants' self-reported student use of computers also shows an important shift. On the pre survey, 35 per cent of the participants reported their students' daily use of computers while only 27 per cent of participants reported daily use of computers by their students, suggesting no change. However, in the 2 to 4 times a week category, participants' students' use of computers shifted from 18 per cent on the pre survey to 60 per cent on the post survey. It is possible to interpret this as an important shift toward both more frequent use of computers and more realistic and planned use of computers rather than use of computers just to be using them. Participants also reported increases in conversations about hardware, software, curriculum, and issues. Eighty per cent of the participants reported frequent or occasional conversations with colleagues.

	Pre Survey			Post Survey		
	Frequently	Occasionally	Never	Frequently	Occasionally	Never
Use of a Variety of Applications						
Word Processing	70	12	18	39	46	15
Spreadsheets	12	47	41		39	61
Databases		30	70		54	46
Email		35	65	23	38.5	38.5
Internet	18	59	23	46	39	15
Desktop Publishing	35	30	59	31	38	31
Hypermedia	12	30	59		38	62
Other	47	30	23	23	62	15
Conversations with Others						
About Hardware	12	35	53	53	40	7
About Software	17.5	17.5	65	47	20	33
About Curriculum	12	53	35	40	33	27
About Computer Issues	35	24	41	40	40	20

	Daily	2 to 4 times week	Once a week	Once a month	Never
Student Use of Classroom Computers					
Pre Survey	35	18	23	12	12
Post Survey	27	60	13	0	0

	Pre Survey	Post Survey
Primary Goal for Computer Use		
Teach about Computers	5	0
Teach Computer Applications	11	12.5
Support learning a skill	5	12.5
Integrated with Curriculum	68	75
Never Use	11	0

Table 2. Self-Reported Use of Classroom Computers

Participants' Logs of Assigned Computer Activities

In October of 1999 at the beginning of the ITS Program and again in October of 2000 nearing the end of the ITS Program, participants were asked to submit a log of computer activities assigned to students. Upon examination of the data, it became clear that all participants had not submitted complete sets of weekly assignments. However, thirteen complete sets were available. The most remarkable aspect of these reports was that six of the thirteen participants reported no computer use during the four-week period in October of 1999.

Thus, nearly half of the participants were *not* using the four computers placed in their classroom at all. Of the remaining seven, one participant reported only teacher/administrative use of the classroom computers. Of the six who reported student use of computers during the four week period in October of 1999, three reported that their students had used the Integrated Learning (skill building) System mandated by the school district, three reported Internet use, one reported using *PowerPoint*, and two reported using word processing or desktop publishing programs. Things were very different during the final four-week period in October of 2000. All thirteen participants reported weekly computer use. Use during this period included one participant who used a computer simulation, one who used Logo programming, one who used HyperStudio, one who used a web-based editor, one who reported using a graphics program, one who used digital cameras and scanners, six who reported using *PowerPoint*, and all thirteen reported using word processing programs and the Internet. Clearly, patterns of use had changed.

Responses to Open-Ended Questions: Obstacles and Enablers

On the post survey, participants were asked to respond to two open-ended questions. Their responses to these questions are reported in Table 3. When asked what obstacles they experienced in using computers to support teaching and learning, 47 per cent of the participants mentioned challenges associated with the management of classroom computers and 41 per cent mentioned challenges associated with software including inadequate software availability and disagreements with software decisions made at the school district level. When asked about things that enabled their use of computers to support teaching and learning, 88 per cent of the participants mentioned peer support including building TRTs and fellow ITS participants and 41 per cent mentioned educational opportunities including staff development and the ITS Program. Although only mentioned by 18 and 12 per cent respectively, participants also mentioned their own personal confidence, success, and desire as well as recognition of student successes and enthusiasm for computer supported learning.

Obstacles		Enablers	
Management of classroom computers	47%	Peer support	88%
Problems associated with software	41%	Educational Opportunities	41%
Problems with hardware	41%	Access to hardware and software	23%
Not enough time	35%	Personal confidence, success, desire	18%
Access problems	29%	Administrative support	18%
Lack of support personnel	18%	Student success and enthusiasm	12%

Table 3. Reported Obstacles and Enablers in the Use of Computers to Support Teaching and Learning

Conversations with Participants

In their final semester, the group focused on issues related to leadership and change. Participants studied and discussed strategies for creating change, for promoting learning communities within their school and school division, for coping with criticisms related to computer use, and for advocating changes consistent with their emerging vision of teaching and learning. During the course of these discussions, a number of concerns arose. Participants expressed concerns about the decision-making process within their school division, particularly as related to who made decisions about software purchases and policies, why the use of Integrated Learning Systems was mandated without teacher input, how Internet access was managed, and how hardware was configured in classrooms. The general feeling among participants was that much decision-making was done at the district level with little attention given in that process to teachers' needs and visions or even to students' learning needs. A second area of considerable concern among participants was the difficulties associated with implementing teaching and learning that capitalized on the power and possibilities of technology within a district and state culture that mandates Standards of Learning and high-stakes, multiple choice testing. Finally, while participants recognized the need for planning and collaborating time in order to implement needed curricular and instructional change, they believed that the reality of institutional and systemic structures made such time minimal or nonexistent. Participants felt that their ability to implement innovative practices would not drastically improve until provisions were made for collaborative planning activities. Concerns such as these may well account for the continued high scores on the SoCQ in Stage 0 – Awareness and Stage 2 – Personal. While nonusers have concerns about the integration of computers with teaching and learning and "self" concerns related to impacts on their own practice, the high awareness and "self" concerns have, for these participants, become different in nature. Participants have shifted concern to the impact of issues like district decision-making, standards, and time (continued high Stage 0 - Awareness concerns). Additionally, these systemic concerns are reflected in continued high "self" concerns, increases in concerns for consequences for student learning, and identification of hardware, software and time obstacles. Thus, continued high personal concerns have shifted from personal practice to issues related to systemic concerns and their role in promoting needed system-wide changes and the impact of their efforts on student learning outcomes.

Conclusion

We asked the question: when attitudes change, do changes in practice follow? As reflected in the pre-post SoCQ comparison, participants' attitudes did change. The group profile shifted for one of typical nonusers to one more consistent with users. This newer user profile suggests a shift to concerns related to the impact of computers on student learning, collaboration with others to promote change, and clear ideas they are interested in trying and promoting. Continued high scores on Stage 0 – Awareness and Stage 2 – Personal coupled with concerns expressed in the *Conversations with Participants* section can also be interpreted as demonstrating shifts from basic awareness concerns and the impact on participants' classroom practice concerns about other issues and with concerns about their personal role in promoting change related to systemic as opposed to classroom issues. In addition, changes in attitudes are reflected in changes in practices, such as, more frequent and realistic use, primary use as an integrated part of teaching and learning, and increases in discussions with colleagues as well as increases in both the number of assignments and the variety of applications used. Clearly, there is a positive connection between changes in attitudes and changes in practice. As attitudes become more positive, there are positive changes in practice.

This positive relationship between changes in attitudes and changes in practice is not, however, as dramatic as one might hope. Although results of this research show positive *shifts* in actual classroom and professional practices related to the increased integration of computers to support teaching and learning, the results do not indicate a *transformation* in practice. Based on results of this study, it seems evident that no matter the extent of attitudinal change, there are system-wide obstacles that create a climate that is less than conducive to change. Thus, no matter how much participants profit from their educational experiences, there remain systemic issues that impede their progress toward substantial transformations in educational practice. It may well be that questions related to the effectiveness of teacher education to impact the use of computers to support teaching and learning can only be answered in the broader context of public policy. If we, as teacher educators, hope for a transformation in teaching and learning, we must become active advocates in the public arena as well as skilled teacher educators.

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How Much Is Enough?: Comparing Certificate and Degree Teacher Education Options

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Abstract: Few would argue that teacher education is a central factor in realizing the potential of educational technology to influence teaching and learning. Understanding the impacts of a variety of teacher education options on teachers' concerns, self-reported uses, and self-reported collegial activities related to technology can play an important role in deciding what opportunities are most appropriate. This paper examines two graduate level options: a 12 graduate credit hour certificate program and a 36 graduate hour Master's of Education degree program. Using a two-part questionnaire, 44 teachers from the Master's of Education degree program and 247 teachers from the Certificate Program were surveyed. Responding teachers in the Master's group were matched with a responding teachers in the Certificate group using grade level/subject taught and years of experience. The resulting matched groups are compared and discussed in this paper.

Lack of teacher training is one of the greatest roadblocks to integrating technology with curriculum. Yet, most school districts spend less than 15 percent of their technology budgets on teacher training and development (Office of Technology Assessment, 1995). Yet, teachers must have substantial time if they are to acquire and, in turn, transfer the knowledge and skills necessary to effectively and completely infuse technology with the curriculum and into classroom practice (Hawkins & MacMillan, 1993; Kinnaman, 1990). However, Harvey and Purnell (1995) suggest that there is an overwhelming sentiment that schools have yet to create the kind of training and practice time teachers need in order to learn to effectively integrate technology with the curriculum. Opportunities for teachers to learn about the role of technology to support teaching and learning must do more than simply help them embrace technology; it must also anticipate classroom changes that must accompany technology's widespread use (Guhlin, 1996; Stager, 1995). If teachers are going to be convinced to change their practice and integrate technology into their teaching, they must come to understand the relevance of technology to what they do in the classroom (Shelton & Jones, 1996).

The need to provide meaningful contexts for effective teacher learning is clearly evident. When there is substantial effort and interest in learning to use technology as an integrate part of teaching and learning, teachers are supported to grow and change. As teacher educators, school systems, and universities wrestle with appropriate strategies, incentives, and content for effective teacher education, they must also confront the question - *how much is enough?*

Two Educational Options

In the Winter Semester, 1998, faculty in the Graduate School of Education implemented two new programs. The first was a 12 graduate credit hour ITS Certificate Program – 180 contact hours or the equivalent of 30 inservice days. Although offered as an on campus option, the ITS Certificate Program was primarily offered in collaboration with school divisions throughout Northern Virginia who were seeking to provide educational opportunities for teachers as part of a state-wide initiative for teacher technology competency.

Faculty worked with leaders in these school divisions to organize and deliver the Certificate Program to groups of 24 teachers, kindergarten through twelfth grade including specialty areas. Generally completed in about 18 months, those who chose to complete the Certificate Program with sponsorship from their school division completed five one-credit hour courses focusing on teaching and learning with telecommunications, databases, computer graphics, TV/video, and educational software. They then completed two two-credit hour courses focusing on teaching and learning with desktop publishing and hypermedia. As a capstone class, students completed a 3 credit hour capstone course, Principles of Integration. This course built on knowledge about the individual applications from previous coursework and focused on methods and models of curriculum and instruction that incorporate a range of technology tools. Some school divisions paid all tuition costs while others shared costs with those seeking to complete requirements for the Certificate. Teachers were required to apply to and meet entrance requirements established by the Graduate School of Education and were awarded a Certificate at the completion of the program.

The second program implemented in the Winter Semester, 1998 was a comprehensive, 36 credit hour Master's Degree Program emphasizing Integrating Technology in Schools (ITS) – the equivalent of 440 contact hours with no inservice equivalent. This intensive cohort program consists of four consecutive semesters of study. Cohorts are comprised of 24 practicing teachers. The curriculum for the Master's Degree includes four, three credit hour courses that focus on teaching and learning with a range of technology tools. In addition, teacher-students take two courses that focus on social issues related to technology and education and learning and teaching. They enroll in a Web-Based Learning course, and, like those in the Certificate Program, complete Principles of Integration. Finally, teacher-students complete a course focusing on leadership and technology, a course focusing on action research, and a 6 credit hour Practicum. The practicum culminates in the presentation of an action research project to Graduate School of Education faculty. Table 1 summarizes the curriculum for each Program.

12-hour Certificate Program	36-hour Master's Degree Program
Teaching with Telecommunications (1 hr)	Tools 1: Telecommunications and Databases (3 hrs)
Teaching with Databases (1 hr)	Tools 2: Graphics, Simulations, and TV/Video (3 hrs)
Teaching with Computer Graphics (1 hr)	Tools 3: Desktop Publishing and Computational Tools (3 hrs)
Teaching with TV/Video (1 hr)	Tools 4: Multimedia/Hypermedia and Emerging Technologies (3 hrs)
Teaching with Educational Software (1 hr)	Technology, Society, and Education (3 hrs)
Teaching with Desktop Publishing (2 hrs)	Technology and Learning (3 hrs)
Teaching with Hypermedia (2 hrs)	Principles of Technology Integration
Principles of Technology Integration (3 hrs)	Technology Leadership in Schools (3 hrs)
	Educational Research (3 hrs)
	Web-Based Learning (3 hrs)
	Practicum in Instructional Technology (3 hrs)

Table 1. Comparison of Courses for Certificate and Master's Degree Program

To compare the impacts of the two programs on teacher attitudes and self-reported practices, questionnaires were sent to 247 teachers enrolled in the Certificate Program. These teachers had either just completed the Certificate Program or were nearly finished with the capstone course. Of those sent a questionnaire, 153 returned a completed questionnaire (62%). Questionnaires were also sent to 20 teachers who had completed the Master's Degree Program three months previous to receiving the questionnaire and to 24 teachers who were in the final semester of the four-semester Master's Degree Program. Of the 44 teachers who received the questionnaire, 32 were returned (73%).

The questionnaire was divided into two parts. The first part asked about frequency of technology use and the frequency of collegial interactions related to technology planning. The second part of the questionnaire asked participants to complete the Stages of Concern Questionnaire (SoCQ) (Hall, George & Rutherford, 1998). On the SoCQ, respondents are asked to respond to 35 items on a scale of "not true of me at all" to "very true of me." The items are grouped into seven stages (Awareness, Information, Personal, Management, Consequences, Collaboration, and Refocusing) of concern related to an innovation. In this case, the innovation was defined as the integration of technology with the curriculum to support teaching and learning.

It was determined that the most appropriate way to insure that the two groups were comparable, Certificate respondents were matched with a Master's Degree respondent using grade level and subject taught as well as years of teaching experience. Since the number of questionnaires obtained from the Certificate respondents was so large, it was possible to match respondents fairly closely. Demographics for the two groups are, therefore, similar. 46.9 percent of the Master's group and 43.8 percent of the Certificate group were elementary teachers. 18.8 percent of the Master's and the Certificate Group were Middle School teachers. 21.9 percent of both groups were high school teachers. 12.5 percent of the Certificate group and 15.6 percent of the Master's group were technology resource teachers. Average years of teaching for the Certificate group and the Master's group was 12.25 years and 11.97 years respectively.

Summary and Discussion of Questionnaire Results

Participants' responses to the thirty-five items on the pre and post Stages of Concern Questionnaire (SoCQ) were grouped by relevant stage, totaled and converted to percentile scores using guidelines in the SoCQ manual. The stage reflecting the highest percentile score for each participant was identified. When an individual had percentile scores on two stages that were equal, both stages of concern were counted. The stages of highest concern are presented in Table 2. This table reflects a marked difference between stages of concern ranked highest by individuals in the group. The largest number of individuals (10) in the Certificate Program ranked information concerns – general awareness and interest in learning more detail – as their highest concern while 16 in the Master's Degree Program ranked collaboration – a focus on coordination and cooperation with others – as their highest concern. Clearly, respondents in the Certificate Program still felt they needed to learn more while respondents in the Master's Program felt knowledgeable and confident integrating technology to support teaching and learning and had shifted their attention and concerns to collaborative efforts to expand and implement the innovation in broader contexts.

	Stage 0 Awareness	Stage 1 Informational	Stage 2 Personal	Stage 3 Management	Stage 4 Consequences	Stage 5 Collaboration	Stage 6 Refocusing
Certificate	5	10	3	4	0	5	6
Master's	2	1	3	4	2	16	8

Table 2. Highest Stage of Concern by Number of Participants

Percentile scores for each stage were averaged for each group and graphed. This strategy diminishes the diagnostic and prescriptive potentials inherent in individual profiles but provides the ability to better compare the two groups. Results are presented in Figure 1. Information concerns are highest for the Certificate group while awareness – little concern or involvement - and consequences – a focus on the impact of the innovation on students in the respondents' immediate sphere of influence – are lowest. For the Master's Degree Program respondents, the highest group concerns were collaboration with others and personal – uncertainty about the demands of the innovation and inadequacy to meet those demands. The Certificate and Master's Degree groups were most different in the Stages 4, 5, and 6 categories. The high scores in these stages for the Master's Degree group are typical of more experienced users, confident in their knowledge and ability to cope with the innovation.

Two aspects of this figure are particularly interesting. The first is the group score for the Master's Degree group on Stage 0 – Awareness. Intuitively, one would expect awareness – little concern about or involvement with the innovation - to be lower for experienced users. However, individuals who are more experienced, comfortable, and confident users tend to shift their concerns to other aspects. They therefore report very directly that things other than integrating technology with teaching and learning are of concern to them. The second is the high group concern score on Stage 2 – Personal for the Master's Degree respondents. Given the higher concerns in Stages 4, 5, and 6, the high Stage 2 – Personal concerns, like the continued Stage 0 – Awareness concerns, would not be expected.

Since half of the respondents in the Master's Degree group were still actively involved in their final semester, we took the opportunity to ask them to tell us more about their "other" and personal concerns. Participants expressed concerns about their school division's decision-making process, particularly as related to who made decisions about software purchases and policies, why the use of Integrated Learning Systems was mandated without teacher input, how Internet access was managed/blocked, and how hardware was configured in classrooms. The general feeling among participants was that much decision-making was done at the district level with little attention given in that process to teachers' needs and visions or even to students' learning needs.

A second area of considerable concern among participants was the difficulties associated with implementing teaching and learning that capitalized on the power and possibilities of technology within a district and state culture that mandates Standards of Learning and high-stakes, multiple choice testing. Finally, while participants recognized the need for planning and collaborating time in order to implement needed curricular and instructional change, they believed that the reality of institutional and systemic structures makes such time minimal or nonexistent. Thus, high personal concerns of those in the Master's Degree Program are actually reflective of challenges in designing appropriate responses to their concerns about consequences for student learning, collaboration with others, and refocusing – the need to explore more universal benefits including the possibility for major changes – not about their roles or ability to integrate technology with in their own practice.

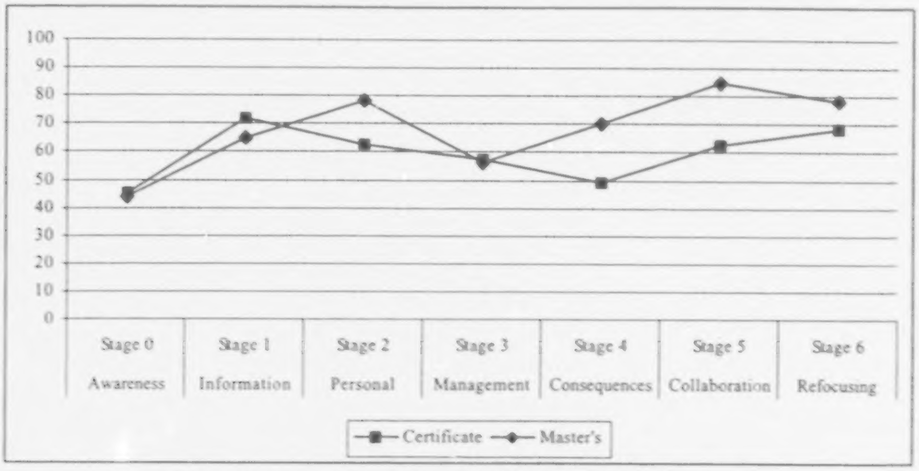

Figure 1. Average Group Percentile Scores by Stage of Concern

To determine if differences in concerns were accompanied by differences in practice, Table 3 presents responses of the two groups to three questions: 1.) use of a variety of computer applications, 2.) frequency of discussions with colleagues, and 3.) primary goal for classroom computer use. The data reflects no substantial difference between the two groups in the frequency of use of a variety of different applications. There is a slight tendency for those in the Master's Degree group to use a wider range of applications. There is, however, a marked difference in the respondents' self-reported frequency of conversations with colleagues about hardware, software, curriculum, and computer issues. Frequent discussions were reported almost twice as often for respondents in the Master's Degree Program as for those in the Certificate Program. This is consistent with the groups' reported collaboration and refocusing concerns and suggests that those in the Master's Degree group are acting on their concerns. A difference in the percent of respondents reporting integration as the primary goal of their use of computers for instruction is also evident in the data. Fifty-three percent of the Certificate group reported integration as their primary goal while 75 percent of the Master's Degree group reported integration as their primary goal. Only 6.3 percent of the Master's group reported learning a skill as a primary goal while 31 percent of the Certificate group stated learning a skill as their primary goal. Fewer of the respondents in the Certificate group appear to have become integrators of technology.

How Much is Enough?

In the opening section, we asked the question: *how much is enough?* Given the data for the Certificate group, it is possible to conclude that their participation in the Certificate Program has supported them in their efforts to use a variety of computer applications as part of their practice. It has encouraged most of them to have at least occasional conversations with colleagues about hardware, software, curriculum, and computer issues. Fifty-three percent of them report integration as their primary goal for classroom computer use. Participants in the Certificate Program have made important strides. One might consider this "enough." Yet, despite these positive advances, one third of them still report only occasional use of all varieties of applications, and forty-seven percent of them still have teaching about computers and teaching skills as their primary goal. In addition, the highest concern for the group is Information – an interest in learning more. They do not seem to be satisfied with their level of knowledge and skills related to integrating technology. If the goal of professional development is for teachers to learn about the role of technology to support teaching and learning and to help teachers anticipate necessary classroom changes (Guhlin, 1996; Stager, 1995) as well as to convince teachers about the relevance of technology to what they do in the classroom (Shelton & Jones, 1996), the Certificate Program was not "enough."

	Certificate Program			Master's Degree Program		
	Frequently	Occasionally	Never	Frequently	Occasionally	Never
Use of a Variety of Applications						
Word Processing	56.3	34.4	9.4	53.1	25	21.9
Spreadsheets	9.4	21.9	68.8	15.6	25	59.4
Databases	3.1	37.5	59.4	12.5	25	62.5
Email	15.6	31.3	53.1	28.1	25	46.9
Internet	50	31.3	18.8	53.1	34.4	12.5
Desktop Publishing	28.1	37.5	34.4	28.1	25	43.8
Hypermedia	9.4	34.4	56.3	12.5	25	62.5
Other	50	31.3	18.8	43.8	40.6	15.6
Conversations with Others						
About Hardware	40.6	25	34.4	62.5	28.1	9.4
About Software	25	28.1	46.9	46.9	31.3	21.9
About Curriculum	21.9	56.3	21.9	56.3	34.4	9.4
About Computer Issues	25	43.8	31.3	56.3	28.1	15.6

	Certificate	Master's Degree
Primary Goal for Computer Use		
Teach about Computers	0	6.3
Teach Computer Applications	15.6	12.5
Support learning a skill	31.3	6.3
Integrated with Curriculum	53.1	75
Never Use	0	0

Table 3. Self-Reported Use of Classroom Computers

Those participating in the Certificate Program were more invested in learning to integrate technology to support teaching and learning than most. Although the school divisions of those in the Certificate Program provided partial or full financial support for their participation in the Program as well as providing the benefit of 12 credit hours of graduate credit, this was not mandatory professional development. Participants volunteered to participate in the Certificate Program and gave up precious after school time to attend class as well as the time it took to complete reading and written assignments. Despite their commitment, the data does not reflect that all their learning needs were met nor have they finished the process of transforming their practice to integrate technology with teaching and learning even after 180 contact hours or the equivalent of 30 inservice days.

This is particularly disturbing when compared with common professional development practices. Trotter (1999) reports that when

> Asked how many hours of basic technology skills training they had received within the past 12 months, the largest group of respondents—31 percent--said one to five hours. Next came the 27 percent of teachers with no training. The figures are worse regarding training on integrating technology into the curriculum: 36 percent of teachers received one to five hours, and another 36 percent received none.

So, is the more robust Master's Degree option "enough." Certainly, data obtained from participants in the Master's Degree Program suggests that they have become established users who have matured to concerns about implementing and revising practices based on their consequences for student learning as well as collaborating with others to further the goal of integrating technology to support teaching and learning. Their reported actions further support the notion that these respondents are not only thinking about these concerns but acting accordingly. They report higher incidences of conversations with colleagues than the Certificate participants. More of them report integration as their primary goal for student computer use. Their higher group score for Stage 6 – Refocusing suggests that they are interested in exploring more universal benefits, the possibility of major changes, and that they have definite ideas about alternatives. They are concerned about seeing their ideas put into practice or at least tried out. These respondents are well on their way not only to being established integrators of technology but also to leadership roles. They appear confident in their ability to implement the innovation but remain concerned and feel unprepared to cope with external pressures that impede their progress. Participants in the Master's Degree group still have high personal concerns about their ability to implement their vision within the context of system-wide structures.

Certainly, more appears to be better, but is it "enough?" Probably not. Although results for the Master's Degree group show positive *shifts* in actual classroom practice and in professional activities related to the increased integration of technology to support teaching and learning, the results do not suggest that these respondents recognize that a *transformation* in teaching and learning is still a vision on the horizon. And they remain concerned that they may not be able to achieve that vision within the confines of existing systemic structures.

Conclusion

For us, there are two lessons to be taken from this research. One, professional development activities designed to promote changes that fully integrate technology to support teaching and learning must be extensive, consistent, and long term. Short term or one shot professional development activities do little to advance the power of inherent in the newer technologies to change teaching and learning. Those who are in teacher education must understand that they are in it for the long haul. Second, teacher educators must listen carefully and take to heart the message sent by the Master's Degree group. That is, their ability to translate their learning into system-wide practices depend not only on what they learn or what they are able to implement in their practice but on the ways in which their learning and practice interact with broader, systemic issues. No matter how much participants profit from their educational experiences, there remain systemic issues that impede their progress toward substantial transformations in educational practice. It may well be that the answer to the question, *how much is enough*, can only be answered in the broader context of public policy. Teacher education may never be "enough." "Enough" may well depend on teacher educators' ability to merge teacher education and advocacy in the public arena.

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Engaging Learners with Technology: An Innovative Professional Development Model

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Abstract: This paper will describe an innovative professional development initiative where teachers, administrators and curriculum development specialists assume the role of students as they explore how the **engaged learning** environment can be supported by technologies in meaningful and authentic ways. The purpose of this paper is to share a replicable, instructional, technology-integration model designed to help educators (pre-service and in-service) develop and implement learning experiences that invite and engage students to construct knowledge and to make meaning of their world. Additionally, details and particulars of the supporting professional development program will be outlined and discussed.

Learning comes naturally. It's what humans do intuitively. The need to understand, to bring order and create patterns to new ideas and concepts, to share this new learning, and to feel empowered to act using this new understanding speaks to the very foundations of learning in today's classroom. Within a classroom, there are observable and measurable indicators which signal that learning is taking place. What does that look like? What are students doing? How are they accomplishing the tasks? How and when does technology support the learning process? How do you know the learning "stuck? Did this process happen accidentally or was there a deliberate plan and scheme to develop such a context for learning. These questions are at the foundation of "engaged learning".

The following treatise will:

- Define *engaged learning*
- Explore how the *engaged learning* environment can be supported by technologies in meaningful and authentic ways
- Describe the steps of the Van Andel Educational Technology School (VAETS) project-based instructional model including the infused strands of problem-solving, collaboration, and technology
- Describe the technologies and curricular materials selected in this project
- Explain how technology can become *transparent* in this engaged learning environment
- Highlight the particulars of the one-week Van Andel Education Institute (VAEI) Teacher Academy

What is Engaged Learning?

Exemplary teachers have always known that their *students* are at the center of the learning in the classroom. Learner-centered awareness can be observed in classrooms where students are encouraged to build upon their experiences and strengths, are provided with realistic options and choices about their learning, are given opportunities to share with fellow learners, are provided with opportunities to assess their progress, are engaged in internal and external reflective dialog to monitor self-learning, and are given appropriate access and use of the necessary tools to support the learning process.

Because learning is a process, not a product, research and its authors such as of Dewey, Vygotsky, Feuerstein, Diamond, Caine, Bransford and others, suggest to us that what students do, what teachers do, what learning tasks students perform, and the type of assessments associated with those tasks are essential factors in achieving engaged learning. Identifying these variables as dimensions of learning helps us, as educators, to document that engaged learning is indeed occurring. These dimensions, as listed and described below, form a clearer picture of an engaged learning culture.

- *Passion for learning*: In a classroom where engaged learning is honored, the learner is involved in the learning process from the beginning. Developing this *passion for learning* comes from being responsible for setting goals, choosing tasks to accomplish those goals, and developing assessments to monitors one's progress in achieving success. In short, the learner must understand the "big picture" and enlist a cadre of thinking and learning strategies to accomplish the tasks.
- *Challenging, authentic tasks*: Challenging learning tasks need to address issues in the real world by integrating a variety of disciplines to solve problems. A blending of content in a multidisciplinary context provides opportunities for sustained, *authentic* learning. When deliberate and thoughtful choices are made about the use of specific technologies, strategies and resources to support their learning, the engaged learner becomes resource savvy.
- *Performance-based assessment*: As an essential part of the instructional process to improve learning, assessment is ongoing, equitable, and purposeful. In an engaged learning context supported with technologies, assessment comes in the form of *performances*, demonstrations, and products that have meaning and purpose for the learner. These examples of evidence should match the goals of the curriculum, represent knowledge and essential skills, and provide authentic contexts for assessment. Tools of assessment such as self, peer, and teacher assessments should evaluate both individual and group efforts.
- *Generative, multi-contextual environments*: The classroom culture must be engaging and responsive to learner needs by providing *multiple contexts* for learning. In order to assist the learner in constructing meaning and understanding, this enriched classroom environment will support strategies whereby the learner can actively solve problems, conduct meaningful inquiry and discovery, and function effectively in a variety of diverse contextual settings.
- *Collaborative, flexible grouping*: Classrooms that encourage and support engaged learning allow students to learn collaboratively. *Flexible* learning communities build upon the diversity of their members and create a more empathetic environment which encourages the pooling of knowledge and experiences of the group. Engaged learning environments challenge the learner to ask complex questions, define the problems, and seek out information and knowledge from professionals. Diverse grouping strategies will provide opportunities to differentiate goals for all students.
- *Reflective, metacognitive dialogue*: Within the culture of an engaged classroon, metacognitive reflection is ongoing. As an essential component of the learning process, learners are consistently engaged in activities that encourage and rely upon *reflective* dialog with peers in order to bring clarity and focus to their thinking and learning. *Metacognitive* opportunities provide each learner with a context for reflection and articulation about his/her individual learning strategies, successes, and growth potential.

These dimensions of learning are at the very foundation of a constructivist instructional model that is currently being implemented with the goal of identifying the most effective ways to integrate current instructional technologies into existing curricular frameworks.

VAETS Engaged Learning Model: Project-based Learning

In an attempt to provide an instructional schemata whereby technology becomes an intuitive part of the learning landscape, this model combines a 5-step process with three interwoven strands of problem-solving, collaboration and technology. Using the collective wisdom of cognitive science, as well as the emerging field of brain-research, this 5-step model helps to create a framework where learning occurs naturally and with purpose:

1. Curriculum Planning – This model speaks to the needs of accountability and assessment with the beginning step of curriculum planning. Great care and detail is given at this first step as the teacher provides the curricular framework using existing standards and benchmarks. The teacher clusters standards or objectives, defines project content, identifies general and specific goals and objectives of

content, instructional technology, and collaborative learning skills, identifies prerequisite skills, plans a strategy for creating teams, sets general project timelines and identifies resources and materials.
*Three strand examples: Teacher planning always involves problem solving and teachers are encouraged to collaborate with colleagues. The Internet, spreadsheets, Inspiration® and other organizers are a natural part of planning.

2. Project Focus – The teacher outlines and presents the general project topic to the students, sets timelines, milestones and assessment options for students, lists resources available, identifies prerequisite skills and competencies, and forms teams.
   *Three strand examples: Teachers must cultivate a project-based culture by modeling and demonstrating problem-solving and collaborative techniques and sampling the technology resources available to students. Teachers should use organizers and a variety of technologies in modeling for students.

3. Project Planning – Students begin preliminary planning, pool their knowledge of the topic, narrow their focus and identify their specific team projects, complete a project planning chart which might include assigning individual roles and responsibilities, confer with the teacher, receive feedback and revise their plans.
   *Three strand examples: Students, of course, will be working collaboratively and should be using some type of graphic organizers such as Inspiration® and they must be required to problem-solve and make decisions about their particular approaches to the project.

4. Project Implementation – Students use a three-story intellect model which involves gathering activities, processing activities and applying activities. (Fogarty, 1995) They create a timeline with one milestone for each task involved, refine their project definition and procedures, decide on the product to be produced, continue to collaborate and cooperatively problem-solve, seek and receive feedback and move toward completion.
   *Three strand examples: Working collaboratively, the students should employ a division of labor. The gathering process should involve the use of electronic encyclopedias, web searching, interviews, textbooks, etc. and some method of electronic recording using word processing, database, spreadsheet, filming,etc. Processing should involve imagination, problem-solving, and manipulation of data to bring clarity and focus to the project. Applying involves the creation of a final product in the form of desktop publishing, an electronic presentation, movie, etc. Students typically use: Inspiration (organizing), Appleworks® (word processing, spreadsheets and slideshows), Hyperstudio® (interactive presentations), Presswriter® (desktop publishing) or iMovie® (movies).

5. Completion – Students do their final revising, polishing and presenting. The teacher and students assess, celebrate, and bring closure to this project by reflecting and discussing where it fits in the big picture and how it leads to further investigations.
   *Three strand examples: Assessing and celebrating may be combined with students collaboratively making their presentations, presenting their documents, playing their videos, etc., explaining their methods and receiving feedback.

This model serves as scaffolding for an engaged learning culture by providing a student-centered vision for learning. This engaged, collaborative learning environment stimulates a passion for learning with authentic, challenging tasks, meaningful opportunities for reflection, and assessments that reflect purposeful learning. As confidence and proficiency increase over time, this scaffolding becomes transparent and the use of technology becomes natural and intuitive.

Van Andel Education Institute: Teacher Academy

The focus of the academy is to explore current cognitive research as it relates to the development of the VAETS Project-based Model. Using the tools of technologies, the participants identify the instructional standards and plan, develop, implement, assess, and evaluate a project using productivity, research, and multimedia resources.

Specific topics such as process writing, research strategies, cognitive mapping and multimedia development are used as focus areas to connect the learning in a project format. Methods used in the academy include direct instruction using short lecture segments, demonstration and hands-on practice of selected technologies. These methods are complemented with modeling of collaborative group activities, independent writing, reflective dialoging, assessment, and evaluation.

The VAEI Teacher Academy is a 1 week, 30 hour immersion into the VAETS Project-based Model. Designed for pre-service and in-service educators in grades K-12. This workshop environment provides the participants with:

- An overview of the latest cognitive and brain-based research as it relates to the educational setting
- The project-based learning model, its components, and its foundations in constructivist theory
- A state-of-the-art technology-rich environment designed to engage learners by focusing attention appropriately in multiple contexts
- Just-in-time training on appropriate educational software and hardware
- A curricular framework document for planning and implementation including curriculum and project planner resources and multimedia design considerations
- Modeling procedures of engaged learning strategies such as cognitive mapping, process writing, collaborative problem-solving strategies, etc.
- Assessment rubrics and guidelines for developing rubrics for student projects
- Sample vignettes using the project-based model and supporting technologies
- Hands-on opportunities to experience the process and resources of project-based learning (Each participant is a member of a team which experiences a complete project from planning to completion.)
- Sampling and discussion of pertinent professional articles and publications supporting engaged learning
- Replication scenarios in diverse educational settings

After a successful trial program for 25 participants in the summer of 1999, the VAEI program was expanded in the summer of 2000 to three Teacher Academy sessions. Information about the Teacher Academy offerings was disseminated to area schools and area college and university departments of education. Announcements were placed in a statewide technology newsletter, and invitations were distributed at professional education conferences. With a participation limit of 25, the three sessions were filled in advance and a waiting list was begun. The teachers were drawn from school districts across the midwest and Canada, representing public, private, and charter schools. Some districts sent teams of teachers to create self-supporting networks while others sent individuals. Participants were charged a nominal $50 registration fee. Because the Teacher Academy was funded as an outreach activity of the Van Andel Education Institute, it was possible to return that value to them in the form of curricular materials, workshop notebooks, and support resources. Graduate credit from two local universities and professional development credits from some local school districts were available. The three members of the VAETS staff served as the facilitators for the Teacher Academy.

Conclusion

When learner-centered education is at the heart of today's classroom, we honor the naturalness and intuitiveness of the learner. In his/her quest to bring order and understanding to the world, the learner becomes responsible for the learning process and claims ownership of the process. This ownership of the learning process empowers the learner to gain confidence in his/her ability to think creatively, solve challenging problems and make sense of powerful ideas. Ultimately, this is the purpose and goal of education.

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Preparing Teachers for the School of the Information Society in Greece

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Abstract: Hellenic Pedagogical Institute is implementing a large-scale national teacher-training project. The project aims to expand teachers' understanding in Information and Communication Technologies (ICT) and to equip them with the necessary knowledge and skills in order to support their efforts in utilising ICT effectively to teach particular subjects. Central issue of the design of the project is its flexibility to accommodate the various professional needs, background knowledge and skills, learning styles and inclinations of the teachers. The training process is totally decentralised, transferring to the schools the responsibility for the selection of the training model and the training providers. Final target of the project is the establishment of a life-long training mechanism based on the operation of sustained learning communities around the country. In this paper the design principles as well as the implementation process of the project are presented.

Introduction

As our society changes from an industrial one to an information society, dealing with information is becoming a key element for people. Educational systems of the third millennium face the challenge to reconsider their educational beliefs and teaching routines, in order to be able to effectively prepare the future citizens of the information society.

A central issue of the changes occurring in today's educational systems is the integration of Information and Communication Technologies (ICT) into subject teaching. The educational community has recognised the value of ICT as a teaching tool since the early 80's. However, in a world crossed by the information super-highways, ICT plays a more significant role than just that of another teaching tool. ICT can perform as the vehicle for the reform of the educational strategies towards a student-oriented learning model, transferring part of the responsibility of the learning process to the students, implying at the same time new roles for the teachers and changes in their classroom performance.

The effective integration of ICT in teaching and learning is directly dependent on teachers' knowledge, skills and abilities to make decisions about when, when not and how to use ICT in teaching particular subjects. Therefore, supporting teachers in this direction is one of the most critical factors for the successful integration of these technologies in daily school practice. Helping teachers in integrating ICT into their teaching process has little to do with helping people operating machines. It has to do mainly with supplying teachers with a powerful educational toolkit, which can enhance their own expertise and professional practice, redefining at the same time their profession's core practices and requirements.

Since learning takes place in a social context, teachers' communication and collaboration with each other as well as with experts, is of major importance in extending their knowledge base and skills. In this perspective, ICT can perform both as the motivation and the platform for the creation of the required communication and collaboration channels for the establishment and operation of learning communities.

In the last four years the Greek Ministry of Education has been working through various actions and projects to introduce ICT technology into the Greek primary and secondary schools. Towards meeting this target, new and flexible curricula have been developed capable of accommodating ICT based activities and new educational material that has been produced (books, CD-ROMs, Web-based material). All schools will have an Internet connection by 2001 providing all teachers and students with e-mail addresses. Additionally, the schools' network is being established offering access to educational content and services over the Web.

However, the key figures for the introduction of any innovation introduced in schools are always the teachers. In this context, many pilot teacher-training programmes have been taking place around the country, making use of various teaching and delivery methods.

Project Design

Recently the Ministry of Education announced a project to train 75,000 primary and secondary teachers (80 percent of all the schoolteachers in Greece) in ICT as an educational and professional tool. The project -managed by the Hellenic Pedagogical Institute (HPI) (http://www.pi-schools.gr)- is the largest and most comprehensive national investment programme ever to be implemented as far as education is concerned. The scope of the project -entitled "Preparing teachers of the Information Society"- is to integrate ICT technologies into daily school practice, in an attempt to provide students with the knowledge and skills required by the Information Society. Within this framework, the project aims to expand teachers' understanding in ICT and to equip them with the necessary knowledge and skills in order to support their efforts in utilising ICT effectively to teach particular subjects.

Central issue of the design of the project is its flexibility to accommodate the various professional needs, background knowledge and possible difficulties of the teachers around the country. Thus, training process makes use of various models as far as the delivery methods and training activities are concerned. In this context, the schools are designated as decision-making units as far as the training model and the training providers are concerned.

One of the main principles of the project is the presumption that teachers themselves will take personal responsibility and create opportunities for their professional development in a self-learning approach. In a continuously changing world, learning should be a life-long process, taking place in all the situations, in which people live and work. From this point of view, the project focuses on providing the teachers' community with the appropriate environment in order to be able to make out their own learning and professional development paths (Rogers, 1977).

The final target of the project is to develop a non-intensive and life-long training mechanism through the establishment of learning and communities around the country capable to support a peer-to-peer training model (Wilson & Ryder, 1998).

Training Programmes

Within the framework of the project various training programmes are organised across the country involving all the Greek primary and secondary teachers as well as local administrative heads and school masters.

The programmes targeted at the teaching staff, are structured under three main axes:

- Axis-1: basic skills in the use of ICT:

These particular training programmes aim at improving self-confidence, knowledge and skills of the teachers as far as the use of new technologies is concerned. The curriculum of the programmes is tailored to the particular needs of the Greek teachers determined through the various pilot projects that have been implemented during the last four years. The main principle under which the programmes are structured is the belief that helping teachers in using ICT is more than training people in operating machines (Wild, 1996). Thus the training material and the activities designed for the programmes derive from the schools' daily programme and the particular needs of various teaching subjects.

- Axis-2: use of ICT in subject teaching:

In the context of these training programmes teachers are expected to participate in activities relating to the use of ICT as a teaching tool. The curriculum of the programmes is structured over various special activities. The activities include the development of lesson plans as well as the teaching process using educational software titles as well as common applications (browser, e-mail, word processor etc.) used in subject teaching. The effective use of ICT in the classroom implies new roles for the teachers, who are expected to act as facilitators of their students' approach to learning (Bickmore-Brand, 1996). In an attempt to promote and articulate new roles in teaching and learning process, during the implementation of the activities, teachers play the role of the student, having an expert as an instructor.

- Axis-3: design and production of educational activities, lesson-plans and scenarios concerning ICT exploitation in classroom.

The programmes of this axis concern teachers who feel confident in using ICT. The programmes will be implemented within the school or on a co-operative basis among a number of schools. Within the context of the programme, work groups are established with the active participation of both teachers and pupils.

The important issues in these programmes are peer-to-peer interaction among teachers as well as the active participation of the members of the group. Each work-group will implement an interdisciplinary project with the participation of the students. The programme encourages project themes, which are of interest to the local societies of the schools, in an attempt to bring schools in touch with the real world. Additionally, schools from remote locations collaborate-using the facilities of GroupWare tools - in developing projects of common interest. In that way, the programmes are expected to perform as the kick off activity for the establishment and operation of the learning communities.

There is no defined curriculum for these particular programmes, as work-groups make use of the educational material provided by the Greek Web for Schools (GWfS). In this context, participants are neither expected to have the same starting points nor to achieve similar outcomes. The target here is to provide teachers the opportunity to improve their understanding and to extend their knowledge base about the effective use of ICT as a learning tool (Underwood & Cavedish, 1996).

The general target of the three above programmes is to provide the teachers the skills and abilities needed to evaluate ICT applications and resources, to be able to chose the appropriate for teaching, assessment, school management as well as self-learning and professional evolution. Additionally, teachers are expected to be able to determine the abilities required from their students in order to construct their knowledge model through the use of new technologies (Davis, 1998).

Additionally, the following training programmes are organised:

- Head-teacher and administrative staff training, so that those involved will then serve as mentors and facilitators for their colleagues. The role of head-teachers is rather critical in the integration of education innovations into the school environment as they are in daily contact with the teaching staff, managing and encouraging their efforts (Lawson & Comber, 1999).
- The trainers who are going to facilitate group-work at schools will participate in special seminars organised by the HPI. The scope of these seminars is to equip the trainers with the expertise gained by Institutions in Greece and abroad from various projects. Additionally, the seminars will inform trainers about the alternative resources, which will be used during the training process.

Due to landscape peculiarities, too many isolated small schools -basically primary schools- exist in Greece, which are served by only one or two teachers. Especially for this kind of schools, a pilot training programme is going to operate, in the project's framework. Specifically, these schools are supplied with special equipment and fast Internet connection, in order to be able to participate in on-line training programmes, using synchronous multimedia communication. The additional outcome expected from this pilot programme, is to bring the students and the local communities of these areas in touch with human and digital resources from around the country, removing in that way their isolation.

Support Activities

The training process will be facilitated and supported by a number of actions and activities aimed at firstly making the life of the participants easier and secondly helping them articulate the knowledge offered to them. Additionally, the support activities aim to enrich the existing infrastructure in the domain of teacher training.

The teachers participating to the training programmes are supplied with a multimedia PC and Internet connection for home use. In that way teachers will have the opportunity to practice as well as to prepare their lesson plans and material.

Local training support centres are established across the country. The role of these centres is to function as a reference place for trainers and trainees. The centres are staffed with expert scientists and are equipped with state-of-the-art laboratories and updated libraries.

A 24/7 help desk centre operates in the HPI in an attempt to solve the various problems that occur during the training process.

The educational environment implemented within the context of the project "Added Value Services to the GWfS" will perform as the virtual reference and meeting place for the participants of the training process. (Papadopoulos et al, 2000)

Evaluation-Quality Assurance

The quality of the training process is firstly going to be ensured by the quality of the educational material. The HPI has developed a specification framework as far as the educational material is concerned. Additionally, the HPI has developed curricula for all the training programmes describing the targets of the training process and outlines the skills and abilities expected to be acquired (Fleischman & Williams, 1996).

Universities and Institutions from all over the country participate in the process of developing material The training material consists of activity-based lesson plans for subject teaching using ICT, trainers' guidelines, educational software titles as well as web-based material.

As a second level of quality assurance, the abilities and the skills developed by the teachers are going to be evaluated through an assessment mechanism compatible with the European Union Initiatives. Finally, external evaluators will evaluate the whole project as far as the effectiveness of: the training mechanism, the training centres and the training material.

Implementation

The HPI has developed the curricula for all the programmes included in the project. Additionally, the HPI has produced a specification framework as far as the training material is concerned. Both the curricula and the specifications' framework have been published in the GWfS and have also been distributed to all the schools around the country.

The training material varies depending on the training programme as well as the training model and includes lecture notes, multimedia titles, web-based material, interactive tutorials etc. The HPI has produced sample-training material while, already existing material is being evaluated. Additionally, Universities, Teacher Unions and other Institutions around the country produce material.

The training programmes concerning the axes 1 and 2 are offered through three alternative models. The models differ mainly on the delivery method adapted:

- In-school training, which includes face to face training seminars. The trainers can be either members of the school's teaching staff (e.g. the IT teacher) or external trainers. Wherever possible, the training process takes place with the participation of students.
- Seminars organised by training providers. Teachers sit in seminars organised at the premises of the training providers. The later have to ensure that the computer lab will be available for practice purposes, for at least six months after the end of the seminars.
- Distance training, provided both by the training providers and the HPI. The training process will make use of both web-based and conventional distance training methods.

A call was made addressed to all the organisations, institutions etc. intending to participate in the training process as training providers. The training providers have to meet a number of prerequisites concerning the equipment and the services they can provide. Only approved training providers are allowed to deliver training. These providers had to demonstrate a track record of expertise and experience in providing successful training, advice and materials. Additionally, the call was addressed to individuals who have expertise in ICT use as a teaching and learning tool. The individuals who meet the prerequisites are going to be used as training staff by the training providers or to perform as independent trainers in in-school training programmes.

The approved training providers and individual trainers are included in a list published by HPI. The training providers and the trainers can cover all the axes of the training programme or just one of them.

The training process will be facilitated and co-ordinated by the local support training centres, which are founded in all the regions of the country. The training support centres are managed by training committees (consisting of administrative staff, facilitators, scientists/experienced teachers), which are responsible for the implementation of the project at the local level and the communication process with the schools of the region as well as with the HPI.

Seminars, concerning the scopes and the design principles of the project, are organised for school head-teachers and the local administrative staff. Additionally, special trainer's training is organised around the country. The participants in these seminars are going to perform as facilitators of the group work in schools (axis 3). The training content focuses on the trainers' role as tutors to colleagues and aims to support them in successfully co-ordinating the teamwork as well as to stimulate the participating teachers. The seminars are held by the HPI in all the capital cities of the regions of the country with the contribution of the local Universities and municipalities.

The teaching staff of the schools decides how they will be trained. Schools are asked to fill in and submit to the local training committee an application form describing the training models and the resources required for the training. It is possible for a school to choose more than one training model according to the particular needs of its staff. It is also possible for a teacher to choose different training models for the various programmes in which he/she participates. Depending on the members of the staff seeking training and the chosen training model the schools receive a fund to cover the training expenses.

The following training programmes are being implemented:

The training programmes under axis 1 concern teachers with minimal or no previous experience in the use of ICT. They include seminars focusing on the achievement of basic ICT skills. The teachers work in computer labs (one person per computer) in groups of 10-15 people with the presence of one or two trainers. At the end of the seminars the teachers are asked to sit an on-line exam in order to receive accreditation for their training.

The training programmes under axis 2 concern teachers who have attended axis-1 programmes or already have the basic knowledge and skills in the use of ICT. The teachers are expected to work in groups (three persons per computer) in the computer lab. At the end of the training programmes the teachers have to carry out assignments concerning the production of teaching scenarios and lesson plans, exploiting ICT use in subject teaching.

The training programmes under axis 3 concern teachers who have either successfully completed axis 2 or have already adequate previous experience in using ICT.

The teachers participate in work groups consisted of the members of teaching staff of the same or different schools. The work groups carry out projects with the participation of their students and under the co-ordination of facilitators. The content of the projects implemented by the work-groups is a synthesis of individual interests and inclinations pointed out by the participating teachers.

Each facilitator may be involved in up to five work groups. The facilitators' contribution to the work group concerns among others:

- the determination of the subject and the methodology of the group work
- the planning and the documentation of the methodology followed to implement the project
- the definition of the learning targets
- the encouragement of the work group
- the facilitation of communication and collaboration among different work groups.
- the technical support of the work groups
- the synthesis, the presentation and the publishing of the results of the group's work.

The facilitators also organise seminars/meetings, for the members of work groups they facilitate. During these meetings, the groups will present the interim results of their work and receive feedback by their colleagues.

The results of the work of the groups are published in the GWfS and are expected to perform as reference material for other groups.

Conclusions-Further Work

First of all, the project aims in supporting teachers to overcome their feeling of insecurity in dealing with new technologies. Moreover, a serious attempt was made in order to bring teachers in touch with the potential and features of the use of ICT in teaching and learning. Teachers' perceptions about innovations in teaching and learning are continuously revised according to the feedback they receive from their students as well as by the changes in society and the evolutions in technology. Under this prism, the project aims in establishing a training environment capable to accommodate different perceptions derived from different skills and inclinations.

The project spends a lot of efforts in transferring the responsibility for the selection of the training model, the training providers and the training rate to the teachers. Furthermore -through the teamwork organised in schools- the project makes an attempt to involve schools in research activities concerning the cross curriculum utilisation of ICT. In that way, schools are expected to develop the abilities to investigate, evaluate and finally integrate into the classroom the innovations in technology and society.

One of the main issues of the project is the establishment of a human network of experts around the country. The human network is going to use the infrastructure of the GWfS in order to create the required communication and collaboration channels. Additionally, the members of the network are expected to facilitate the enrichment and management of the educational content available over the GWfS. The human network will be facilitated by the existence of the local training centres, which are expected to perform as local training institutions, covering not only the needs of the project, but also acting as a permanent support mechanism for the professional development of the Greek teachers.

At the beginning of the project HPI was concentrated in the development of the training curricula as well as in the training material specifications. The training curricula describe the targets of the training process and outlines the skills and abilities expected. It is for the training providers to decide the teaching methods and strategies in order to achieve the described targets. Furthermore, the whole national curriculum is being reconsidered in order to be able to accommodate ICT based activities.

Final target of the project is the establishment and operation of sustained learning communities, which can not only perform as a peer-to-peer interaction environment for the Greek teachers but also to bring in touch all the members of the educational community towards a life-long training approach.

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TEACHERS' PERCEPTIONS of TECHNOLOGY IN-SERVICE: A CASE STUDY

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Abstract: A series of case study-type interviews were conducted with selected K-12 teachers on their perceptions of technology integration in-service activities in which they had participated. Teachers were selected to represent rural and urban, small to large schools, and a variety of disciplines. The primary goals were to determine the depth and breadth of in-service activities teachers experienced such as variety of computer applications, utility applications versus instructional applications, Internet usage, degree of expertise, and degree of successful implementation developed from the experiences. Teachers reported positive results of in-service in terms of awareness of the technologies available. Often, recent in-service activities were focused on administrative/utility functions rather than instructional applications. One major concern mentioned was that during the in-service activities, teaching strategies and 'hands-on' time were seldom included. Many teachers expressed frustration with the limited time allocated to the topics/skills being taught in the in-service activities.

Background and Rationale

In the recent past, the Wyoming State Department of Education has mandated the integration of technology in the classroom. There have been a number of initiatives by the State Department of Education to encourage technology use. Along with the Wyoming School University Partnership's Staff Development Academy (a consortium of school districts, community colleges and the University of Wyoming), school districts have been required to develop and initiate Technology Plans. The State of Wyoming and QWest have provided Internet access to all its schools. With the introduction of the WHEN (Wyoming High School Equality Network), compressed video has been brought into all the high schools in the state, community colleges and the College of Education. Regional technology training centers have been put into place in order to contend with the vast distances that separate the state populations to provide local staff development centers. And, within the University, the College of Education has had a strong mandate to raise the level of technology use in the pre-service program for both student and faculty. Obviously with an influx of this much technology into a state, there is a need to know how well our teachers are coping. Are they using these technologies? Do they have access? Are they being trained effectively to use these technologies? Are they receiving support?

This situation is not unique to Wyoming. Nationally, Internet use has been on the rise in all public schools growing from 35 percent in 1994 to 78 percent in 1997(Bare & Meek 1998). We are now rapidly approaching a level of 95 percent use of Internet use in Wyoming schools in the year 2000. Another major trend is in the arena of standards based assessment for both in-service and pre-service teachers. Both are now required to begin to meet technology standards on a national level. ISTE's (International Society for Technology in Education) National Educational Technology Standards for Teachers quite clearly states," All candidates seeking certification or endorsement in teacher preparation should meet educational technology standards" (ISTE, 2000). NCATE (National Council on the Accreditation of Teacher Education) has responded with a similar standards requirement (NCATE, 2000). Several states have responded with commitments to implement these standards. For example, Utah has fulfilled its commitment to public schools to provide access to educational technologies that promises to enhance teaching and learning (Tyner. 1998). Missouri has begun investigations to determine the status of technology integration in schools as well as provide laptop computers to all College of Education majors (University of Missouri, 1998).

In spite of all of the efforts to improve the quality of education and integrate new technologies, it has been suggested that most teachers continue to teach the way they have in the past (Sparks & Hirsh, 2000). The argument has been well documented that purchasing new technology equipment and software alone does little to cause effective change in the classroom (Hite, 2000). Recent investigations, indicated that this influx of technologies into the educational system has caused many teachers express high degrees of frustration and bewilderment as how to integrate these technologies into their classroom instructions. At the same time, the school districts have established technology integration and staff development as primary goals (Reynolds, 1999). Given that school districts have established technology integration and staff development as primary goals, and recognizing that teacher participation in both these areas is increasing, the question that we must ask is, "What are the teacher's perceptions as to the effectiveness of these efforts?"

Objectives of the Study

The intent of the study was to determine the answers to the following statements, which also served as the interview questions for the study:

1. What technology do you currently use in your classroom? How often?
2. To how much technology do you have access?
3. How does the technology that you access suit your needs?
4. What recent in-service activities has the district provided to you?
5. What have you implemented as a result of these in-service activities?
6. What barriers exist that prevent you from integrating technology?
7. How would you integrate more technology if it were available?
8. What should the district do to enable you to integrate more technology?

Procedure

A naturalistic inquiry approach was used to conduct this study. This approach was selected in order to facilitate on-site observations while schools were in session and to enable unsolicited answers to be followed by additional inquiry during the interview (Lincoln & Guba, 1895, Reynolds, 1999). Selected high schools were contacted throughout Wyoming in the fall of 2000 and the researchers obtained permission to interview various teachers within the school districts. Teachers were sought out that were users of technology in the classroom rather than the technology professionals enlisted by the school districts to improve technology use. However, it should be noted that on at least two occasions, the latter individuals did find their way into the interview process. The questionnaire was designed to elicit responses in an informal setting. Each interviewee was given a questionnaire and free flowing discussion took place, using the lead questions as a guide. The data developed in these discussions was extracted from the taped conversations and the extensive field notes taken by the researchers during the interviews.

Results

The intent of the interview questions was to obtain teachers' perceptions as to the availability of technology, and to what extent and how often they use technology in their classrooms. Moreover, the primary focus was to determine recent in-service activities, their effectiveness, and how well the in-service prepared them to integrate technology into their instruction. We were also interested in determining how much support they receive as follow-up to the in-service activity. And, we were also curious as to the identification of barriers that prevented them from using technologies, whether they would integrate more technologies if they were made available, and in what way their respective school districts could assist in the process of more integration of technology.

In response to the first question, "What technology do you currently use in your classroom? How often?" the majority of teachers used computers with the basic Microsoft Office package for word processing and presentations, email, and the Internet and WWW. A limited number of teachers indicated they used spreadsheets with their students to teach problem solving. On two occasions, with foreign language and the Schools to Careers program, we saw teaching computer centers with a wider focus on various software packages that supplemented the subject matter. Very few teachers indicated they used peripheral technologies such as; presentation equipment, computers, digital still and video cameras, video editing, scanners, and CD writers.

Responses to the second question, "To how much technology do you have access?" included a wider range of technology was in fact available for use: presentation equipment, computers, Internet, digital still and video cameras, video editing capabilities, scanners, CD writers and a fairly wide array of software. In almost every case, teachers reported that the district provided a wide array of the latest technologies but because of location, complications with scheduling, or lack of expertise, they often perceived it as having limited availability. One teacher stated that there were CD-ROM writers however they were on a teacher's desk as part of their personal computer and it was uncomfortable to ask to use the equipment. Another teacher reported that they had presentation equipment on carts but one had to move up and down stairs or across to another building in order to use it.

In response to question three, "How does the technology that you access suit your needs?' the overall responses were that there was not enough equipment in the necessary places. Most computers were located in the labs and not always accessible because of scheduling conflicts. Several teachers expressed that there was not enough money in the district to purchase the needed items. Limited access to existing computers seemed to be a problem in that certain computers were often dedicated to special groups because of grant purchases. There was a need for more varied and interactive software and a need for presentation hardware in the classroom. One teacher noted that their particular Superintendent liked to see technology and supported the purchases of such things but getting training to support that technology integration was next to impossible.

In response to question four, " What recent in-service activities has the district provided to you?" in-services were related to the needs of the district and not the individual curriculum needs of the teachers. Recent in-services had provided information on how to us the new grading systems in order to meet the needs of the new standards based requirements. One high school however was out of the norm in that they had organized more effectively and had begun a' mentor to mentoree' program with Apple Computer and their in-service was growing in a different direction. A third predominate idea that surfaced was that several districts relied on in-service needs being fulfilled by sending certain teachers to conferences. Basically, the notion that going to a conference some how provided the necessary in-service training for a teacher was the model. The individual rather than the group was the focus and teachers felt like this was granted to the "privileged few."

In response to question five, ""What have you implemented as a result of these in-service activities?" most successful implementation was directly related to the needs of the district. "We were taught how to use the grade book on the computer (in some cases the paper grade book was actually taken away) and now we use the grade book on the computer. " Another example was the implementation of attendance software. One exception, in the case with of the school district using the mentor program, teachers were the most satisfied with this implementation strategy. One teacher would learn a topic and mentor it to a variety of other teachers, including teaching strategies as well as develop expertise in using the technology. The practice of sending selected teachers to a conference was not perceived as being a very effective model unless the 'mentor-mentoree' approach was implemented as a follow-up.

In response to question six, "What barriers exist that prevent you from integrating technology?" the responses were overwhelmingly lack of money, lack of knowledge, resources in the labs, software and equipment, and greater need for time to learn to use and implement technologies into the curriculum. Also, access to technical support and follow-up were often mentioned as major barriers.

In response to question seven, "How would you integrate more technology if it were available?" the answers were more curriculum specific. For example, math teachers wanted graphic calculators and programs such as Geometry Sketch pad. Most teachers expressed the need to make the technologies more mobile or having more of them concentrated in the classroom. Rather than having computer labs which are often generic in nature and are often overbooked, teachers prefer that those technologies were available in the classroom. This change would create the feeling of ownership and the opportunity to realistically make the technology part of the everyday curriculum.

The responses to question eight "What should the district do to enable you to integrate more technology?" were oriented toward a variety of concerns. Having greater access to technologies and providing more time and money for training and integration were prevalent. The teachers voiced the position that the development of a more responsive management team was necessary. Overall, a technology team, which included a technology director, repair crew, integration specialist and data specialist complimented by a strong technology plan, was suggested. Also, the technology plan should reflect the need for planning of obsolesce and rotation of equipment. Better staff development, with more hands on in-service experiences, more follow-up, and creating a cadres of student assistants, were also expressed as primary needs.

Implications

It was enlightening to hear most teachers express that they would like to integrate more technology in their classrooms. But, most of the barriers they expressed pointed toward insufficient or inadequate in-service. Also, it was frequently expressed that the approach by districts to select the 'chosen few' to attend regional and national conferences had limited in-service value. It seemed to be a common theme that in-service to integrate administrative functions i.e. electronic grading and attendance software, was usually quite adequate and had continued technical support. The most commonly expressed frustrations were with instructional software applications where the in-service activities did not include enough 'hands on' time and follow up support. Strategies for ways to integrate instructional software in teaching were frequently mentioned as lacking as well. One positive finding, the process of establishing expertise among a few teachers, who in turn taught their peers, was seen as being one of the more effective types of in-service to aid in the integration of technology.

To effectively integrate technology in classroom instruction, school districts must involve teachers more in the in-service planning and delivery process. Second, school leadership needs to be aware of more "user friendly" ways to make the existing technology accessible. Another strategy is that a continued support system needs to be put in place to aid teachers, for example, when technical assistance is needed, it needs to be easily accessible. The message came through very clear that without the technical support; it was unlikely that much integration would occur.

It was also made clear that too many in-service activities were planned for the large groups where 'hands-on' activities where limited. This approach worked well to develop awareness of technology, but it wasn't very effective for integrating the technology. Smaller group activities in which teachers have the opportunity to practice using the software must become the norm as opposed to the traditional "show and tell' presentation approach. Finally, teachers prefer the in-service activities to be taught by those who can relate to the classroom climate. Teaching strategies, and subject matter related examples must be a part of the technology in-service process. Follow-up support as well must contain a teacher-oriented component.

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Multimodal distance learning: A personal cooperative video on-line asynchronous experience.

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Introduction:

Idaho State University's College of Education serves an area of nearly 40,000 square miles. Three major cities are the loci of economics and higher education in this region. Pocatello, where ISU is based, lies approximately 50 miles west of Idaho Falls and 110 miles east of Twin Falls. Idaho Falls is home to a large federal research facility, as well as to a higher education satellite center and a nearby private college. Twin Falls, whose main source of income is agriculture, also has a well-known state junior college. A few small towns dot the desert landscape between these larger communities. Though rural and sparsely populated, southern Idaho does have a strong emphasis on education, as witnessed by the junior colleges, college centers, and university. Many of the inservice teachers of the 55 school districts within southeastern Idaho participate in graduate degree programs through ISU's College of Education. These graduate programs have, in the past, been supported by faculty who commute from Pocatello to teach night or weekend classes in Idaho Falls or Twin Falls. However, in order to coordinate graduate cohorts in the three cities, to save faculty from the inconvenience (sometimes danger!) of commuting long distances late at night or in extreme weather, and to follow through on its commitment of making graduate courses available to all students in its service area, the College of Education seeks innovative means of delivering graduate courses, including compressed video and web-supported classes.

This paper describes one distance learning class that utilized compressed video and supplemental web-based material to reach students at six different cities and towns. This class was a master's level class on learning theories, with a combined enrollment of 73 students. Besides the larger groups of students located in Pocatello, Idaho Falls, and Twin Falls, smaller groups of students also attended the class from Blackfoot (20 miles east of Pocatello), Malad (60 miles south), and Soda Springs (50 miles southeast). The primary means of delivery was a weekly 3-hour broadcast from Pocatello to the other six sites. During the weekly broadcast, the instructors and students delivered presentations which incorporated compressed video feed, computer, videotape, and Elmo technologies. The broadcast sites in Twin Falls and Idaho Falls also had Elmo, videotape, and computer facilities for transmission. The smaller sites could receive and send audio and compressed video signals, but were unable to send computer-based applications, videotape, or Elmo images.

The class met one night each week over a sixteen week semester. A different learning theory was presented each week by the instructor, during the first half of the class. The following week, that same learning theory would be presented in greater detail by a group of six to eight students, during the second half of the class meeting. Groups were assigned during the first week of the semester and did not begin their reports until the third week of the semester. Each presentation was required to include an overview of the learning theory, discussion of a research article, and a class activity which demonstrated the principles of the particular learning theory. Group members came from all the class sites and so, in order to cooperatively develop the different components of their presentation, the group members had to communicate over long distances. Brief "meetings" during the evening breaks, asynchronous messages on the WebCT bulletin board, personal email communication, and long distance phone calls were the primary means of communication.

Outside of class, students utilized on-line components of WebCT to access additional information, quizzes, and examinations. The WebCT sections of the course included course contents, quizzes, and communication. The syllabus and calendar, as well as chapter reviews, were posted under course contents. The course contents section also contained the instructor's and students' electronic presentations, converted to .pdf files and posted for downloading. This was an economical way to distribute hand-outs and class notes to all the students without photocopying and sending them to the sites. Also within the course content section were chapter quizzes linked to the chapter reviews. Chapter quizzes and two examinations were created and posted, using WebCT's capabilities to create objective and short-answer assessments. Ten quizzes assessed students' comprehension of the text through 15 multiple choice questions. At the mid-term and at the end of the course, multiple-choice examinations (50 items) were posted which tested the students on content knowledge of both text and lectures.

On-line communication included a bulletin board which supported asynchronous conversations. The bulletin board was organized into a main forum to which all students had access, and eleven subject-specific forums. Weekly study questions were posted to the main forum by the instructor; all students were expected to discuss the question via the bulletin board. The eleven forums were reserved for discussions between members of a presentation group. These discussion groups were limited in their membership; only those students who were part of that presentation group could see the messages posted to that forum. The bulletin board group fora were central to the cooperative groups' communication and planning of their presentation. The students' cooperative groups posted on the bulletin board: messages to each other, drafts of electronic presentations and hand-outs, and research articles to be read. The student groups also used the chatrooms in WebCT for synchronous planning sessions as they coordinated their group's presentation on a specific learning theory

Method:

A survey of the students was undertaken to determine which of the various distance learning technologies was used most frequently by the students in the preparation and delivery of their group presentations, and whether particular technological components facilitated or hindered their learning experience. The survey consisted of four parts, only three of which are touched upon here (demographics, student assessment of technological components, number of distance learning/WebCT classes). The first part collected demographic information about the students, including the site from which they took the class, their age, their gender, and which their area of concentration within the Master's of Education program. Of the 73 students enrolled in the class, 67 attended the night the survey was delivered. Table 1 summarizes the class demographics of these 67 students.

Gender	Age	Class Location	Master's Degree Program
F = 39 M = 28	<30 = 14 30-40 = 20 <40 = 29 not reporting = 4	Pocatello = 18 Twin Falls = 23 Idaho Falls = 16 Others = 9	Ed Technology = 34 Ed Administration = 14 Human Resources Training = 8 Curriculum = 3 Others = 8

Table 1. Demographics (number of students in each category)

This paper reports the students' responses to the second part of the survey, which examined three major constructs. The students were asked to rate specific technological elements of the class relative to (1) how well the technology supported the class objectives; (2) how well the technology supported the group presentations and (3) how well the technology facilitated their learning as individuals. As can be seen in Table 2, the questions dealt with technological components of the compressed video broadcast, as well as elements of the WebCT supplement.

Components 1-4 are those which were used during the compressed video broadcast during class. The instructor and the presenting groups used these components to varying extents. Students at the remote sites did not have all these technologies at their sites, but they interacted with them to the extent that the instructor or other students used them. Components 5-7 refer to elements of the course content available at WebCT site, including chapter summaries and overviews authored by the instructor, articles and handouts which were available in PDF format on the web site; and quizzes and exams. Components 8-11 deal with electronic communications through WebCT, especially the bulletin board and chatrooms. Each component was rated on a Likert scale of 1 to 4, from Strongly Disagree to Strongly Agree.

Construct	Technological Component
I. This component supported the class goals:	A: Compressed Video Components • Live video feed of instructor and presenters • Electronic presentations (PowerPoint) • Computer applications in class (Internet, etc) • Other media sources (Elmo, videotape) B: WebCT Components: • Chapter summaries and reviews on WebCT • Quizzes and exams on WebCT • PDF documents to download from WebCT • Bulletin Board Communication (study questions) • Bulletin Board Communication (group forums) • Chatroom communication • Email with instructor
II. This component facilitiated our group presentations:	
III. This component facilitiated my learning:	

Table 2. The constructs and components rated by the student survey

Table 3 indicates the average rating and standard deviation for each construct.

Construct	Component	Mean	Std. Dev.	Mode
I. Class Goals	A. Compressed Video (#1-4)	3.01	.59	3
I. Class Goals	B. WebCT (#5-11)	2.86	.59	3
II. Group Presentations	A. Compressed Video (#1-4)	3.02	.55	3
II. Group Presentations	B. WebCT (#5-11)	2.90	1.02	3
III. Individual Learning	A. Compressed Video (#1-4)	2.92	.58	3
III. Individual Learning	B. WebCT (#5-11)	2.77	.64	3

Table 3. Mean, Standard Deviation, and Modal Scores for Constructs Measured by Student Survey

Results:

As indicated in Table 3, most of the response to the various technological components of the course was positive. Students found that the compressed video format was the most used and most useful in supporting the class objectives and their group presentations; they also indicated that the compressed video format supported their individual learning more successfully than did the WebCT components. The table further suggests that there is a greater variation in some scores than in others. For example, while the standard deviation is similar for four out of the six constructs, the use of WebCT components to support the group presentations was rated from strongly negative (1) to strongly positive (4). This is due in large part to the students' use and perception of the two functions of WebCT – presenting content and communication. Those portions of WebCT which conveyed content (overviews, articles, hand-outs, quizzes; components #5-7) were rated mostly negatively by the students (average score of 2.5). Those elements of WebCT which dealt with communication, however, were rated highly by the students, especially for planning and presenting their collaborative group projects. The use of the bulletin board (components #8-9) for group presentations (construct II) had an average score of 2.9 (SD = 0.9; mode = 3); the use of chatrooms had an average score of 2.83 (SD = 1.06); and the use of email had an average score of 3.3 (SD = 0.9).

Student valuation of either the compressed video broadcast or the WebCT supplements to the course does not appear to be related to their experience with these formats. As Tables 4 and 5 indicates, there is no clear increase or decrease in students' assessment of the technological components relative to the constructs over time. Students for whom this was their second distance learning course tended to rate the constructs at a slightly lower level than their counterparts with either more or less experience with distance learning (Table 4). Students for whom this was the third (or more) class supplemented by WebCT which they have taken, tended to rate the WebCT components slightly more negatively than their counterparts who had had only one or two previous web-supplemented classes (Table 5); however, there is no real trend in the students' assessment of either the compressed video or the WebCT components related to their experience with these formats.

Conclusion:

Students' high rating of the video compressed broadcast and the incorporation of videotape, electronic presentations, and other technologies in the weekly broadcast is not surprising. These elements were incorporated into most of the lectures and group presentations, so all students interacted with these technologies on a regular basis. However, the use of the WebCT supplements to the class was determined by the individual students. Class participation, including participation in the WebCT site, was incorporated into each student's grade, but it contributed only a small fraction to the student's overall score. Therefore, students had only weak external motivation for using the WebCT site. Intrinsic factors would be the primary motivators for the students' use of the WebCT resources, bulletin boards, and chatrooms. It appears from the survey results that students tended to use the WebCT site primarily for communication rather than for additional content. Further study is required to determine what factors may have limited or enhanced students' use and value of the chapter summaries, topical overviews, and articles which were available as part of the course content.

Construct	# of distance learning classes	Positive (2.6 – 4.0)	Negative (1.0 – 2.5)	Construct	# of distance learning classes	Positive (2.6 – 4.0)	Negative (1.0 – 2.5)
I.A.	1	22 (71%)	9 (29%)	I.B	1	26 (77%)	5 (23%)
	2	10 (63%)	6 (37%)		2	12 (75%)	4 (25%)
	3	15 (83%	3 (17%)		3	13 (79%)	5 (21%)
II.A.	1	24 (77%)	7 (23%)	II.B.	1	25 (81%)	6 (19%)
	2	10 (63%)	6 (37%)		2	12 (75%)	4 (25%)
	3	12 (67%)	6 (33%)		3	10 (56%)	8
III.A.	1	23 (74%)	8 (26%)	III.B	1	23 (74%)	8 (26%)
	2	9 (56%)	7 (43%)		2	10 (63%)	6 (37%)
	3	13 (72%)	5 (28%)		3	9 (45%)	11 (55%)

Table 4. Students' rating of constructs and components based on number of compressed video distance learning classes they have had.

Construct	# of WebCT classes	Positive (2.6 – 4.0)	Negative (1.0 – 2.5)	Construct	# of WebCT classes	Positive (2.6 – 4.0)	Negative (1.0 – 2.5)
I.A.	1	20 (71%)	8 (29%)	I.B.	1	22 (79%)	6 (21%)
	2	16 (80%)	4 (20%)		2	16 (80%)	4 (20%)
	3	10 (63%)	6 (37%)		3	12 (75%)	4 (25%)

II.A.	1	22 (79%)	6 (21%)	II.B.	1	21 (75%)	7 (25%)
	2	11 (55%)	9 (45%)		2	14 (70%)	6 (30%)
	3	13 (81%)	3 (19%)		3	10 (63%)	6 (37%)
III.A.	1	21 (75%)	7 (25%)	III.B.	1	17 (61%)	11 (39%)
	2	13 (65%)	7 (35%)		2	15 (75%)	5 (25%)
	3	10 (63%)	6(37%)		3	9 (56%)	7 (44%)

Table 5. Students' rating of constructs and components based on number of courses they have taken supplemented by WebCT.

The most highly rated components of the WebCT resources were those dealing with communications. Most students strongly agreed that the bulletin board and email contact with instructors and fellow students were very important to supporting the class objectives, planning and preparing group presentations, and facilitating individual learning. In some ways, the bulletin boards, chatrooms and email communication created a new community consisting of students and instructors. This electronic community gaves names and personalities to the otherwise anonymous faces that we saw each week over the compressed video. The combination of on-line communication and weekly visual contact was a unique element in the distance learning experience.

Course Design Overview of a Web-Based M.S. Program

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Abstract

This poster presentation will provide an overview of the course design of the Master of Science in Agronomy Distance Education Program at Iowa State University. The presentation will share experiences of the course design and formative evaluations of the courses provided by the program. In the fall of 1998, the Masters of Science in Agronomy Distance Education Program at Iowa State University (ISU) started providing interactive multimedia courses in which most course materials and resources were accessed and delivered through the WWW and CD-ROM. Most of the students enrolled in this program were professionals working in industry and government. Several interactive multimedia activities were developed in the courses. Those activities included *Study Questions*, *In Detail*, *Try This*, *Check This Out*, and *FYI*. Various formative evaluation activities related to the course design have been conducted and actions have been taken to improve the courses and program. Lesson maps, glossaries, and calculation examples have been added to the courses. Additional multimedia presentations have been developed. Links to previous and subsequent lessons have aided with navigation. A search function for topics and words within each course has also been tested.

Overview of the Program

Distance education has a long history of applying technologies in delivering instruction to those who are not able to participate in a campus-based curriculum. Many people involved in distance education are professional individuals who are seeking to pursue advanced degrees and empower themselves with knowledge that is relevant to their career field.

A Masters of Science in Agronomy Distance Education program began in the fall of 1998 at Iowa State University (ISU). The program introduced interactive multimedia courses whereby students could access most course materials and resources through the WWW and CD-ROMs. A major goal of this program was to provide an alternative educational program for professionals working in industry and government to gain an advanced degree in Agronomy without having to attend the campus in person.

The curriculum consists of 12 courses, a one-credit workshop, and a three-credit creative component, totaling 30 semester credits (Iowa State University, 2000). The courseware integrates content material on WWW/CD-ROM with the interactive tools of WebCT (WebCT, 2000) located on an ISU server. The WebCT tool allows students to electronically interact with their instructors and classmates by utilizing a course calendar, discussion board, chat room, student homepage, assignments, emails, and student records. The program began with an enrollment of fifteen students in a fall, 1998 pilot program. In the fall of 2000, 51 students are enrolled in the program. The program has admitted 81 students.

Several interactive multimedia activities were developed in the lessons. Those activities included a) *Study Questions*, b) *In Detail*, c) *Try This*, d) *Check This Out*, and e) *FYI*.

a) *Study Questions* generally provide immediate feedback to the students concerning how well they are grasping the concepts of a particular lesson. They may be simple questions about concepts, or may ask the student to think beyond a particular concept. These questions are not assessed for a grade.

b) An *In Detail* activity probes a concept further without interrupting the flow of a lesson. After the *In Detail* window has been closed, the student returns to the lesson at the same place they left off. This is required information for the lesson and could involve activities like assignments, *Study Questions*, or *Check This Out*.

c) *Try This* activities allow students to try out or practice tasks, further clarifying concepts to the students. These are usually followed by *Study Questions*.

d) *Check This Out* links are connected to external WWW websites aiming to provide additional information to the students on particular subjects. It is a great opportunity to put other well-developed sites to work for our program, especially extension sites from Iowa and other states.

e) *FYI* activities further explain topics and impart tidbits of interesting information. The information is interesting but is intended to be remedial.

Various formative evaluation activities related to the course design have been conducted. Faculty members and students were the primary target groups of the evaluations. Results of these evaluations indicate: a) students believed they were learning as much in the distance environment as they would on campus and b) they liked the interactive multimedia presentations and asked for clear navigation structure. Based on the evaluation results, improvements have been made to the courses and program. For example, lesson maps, glossaries, and calculation examples have been added to the courses. Additional multimedia presentations have been developed. Links to previous and subsequent lessons have aided with navigation. A search function for topics and words within each course has also been tested.

This poster presentation will provide an overview of the course design of the Master of Science in Agronomy Distance Education Program at Iowa State University, and share experiences of the course development and formative evaluation results of the courses. Brochures with detailed information regarding this M.S. in Agronomy Distance Education Program will be available during the poster presentation. The multimedia interactive lessons will also be demonstrated.

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Revolution of the Pedagogical Use of ICT by Influencing the Whole School Community

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Abstract: The only way to make changes in the pedagogical practices of teacher's work is to influence the whole school community in collaborative way. Also the background organizations like the whole commune should actively give the frame of reference and financial resources to make it possible to all students to participate in the information society. Based on these findings ICT Learning Centre of Helsinki University has been developing the practices for in-service training that includes methods like collaborative learning, research based learning, computer assisted team work and distance learning on the net. It is easier to make a change in a school community when there is a team of teachers to adapt new pedagogical skills to use. In this article we present the authentic case: Information Strategy for the Educational Use – Done by Collaborative Work.

Background

In the middle of the first period of the Finnish national information strategy, Committee of the Future (established by the Finnish Parliament) started an extensive evaluation project the goal of which was to devise an up-to-date and well-grounded evaluation of the impact of ICT (Information and Communication Technology) on instruction and learning. The Finnish National Fund for Research and Development (Sitra) carried out the evaluation project which was divided into five sub-projects. One of these sub-reports was an evaluation of institutions of general and vocational education and kindergartens. According to the evaluation, only one fifth of the educational staff extensively applies new technology to support teaching. The new Information Strategy for Education and Research for period 2000–2004 devised by the Finnish Ministry of Education is based largely on the results of this evaluation project and the recommendations made in it. At the same time the city of Helsinki started to equip comprehensive schools and high schools with computers and networks (LAN) and the training ICT for teachers. ICT Learning Centre grounded a research group to study and evaluate the comprehension and ICT skills of teachers, students and parents. One major part of that research was to study teachers' technical skills and pedagogical thinking and relationships between them. In the research it was proved that those teachers who use ICT actively showed to have a more mature insight of the use of ICT in education and generally more sophisticated pedagogical thinking. They also valued ICT more than the others as a tool for collaborative learning and emphasized the active role of the learner in information constructing process. These teachers also believed that it is possible to develop human intelligence. (Hakkarainen 1998b).

The only way to make changes in the pedagogical practices of teacher's work is to influence the whole school community in collaborative way. Also the background organizations like the whole commune should actively give the frame of reference and financial resources to make it possible to all students to participate in the information society.

The Modern Model of Teachers In-service Training

Based on these findings ICT Learning Centre has been developing the practices for in-service training that includes methods like collaborative learning, research based learning, computer assisted team work and distance learning on the net. In all our courses we use multiform teaching containing face-to-face lessons, learning tasks and collaborative team work as project work. We use open learning environments so that all teams can access and make comments to others workspaces. In all of our courses we presume that there will be a group of at least two teachers from a single school and they will work together during the course. It is easier to make a change in a school community when there is a team of teachers to adapt new pedagogical skills to use. Learning tasks are done within the whole school community. In this way we try to guarantee that almost the whole school community will be involved in or at least will be conscious of the learning process.

The basis of all our in-service training is that all the methods and models used are transferable to the student level. When teachers learn to use these methods as a student they have a better ability and willingness to implement the methods into practice with their students. Dissemination of these pedagogical practices facilitate to form modern learning culture.

Open Learning Environments Support the Modern Model of In-Service Training

The use of Open Learning Environments (OLE) supports in an excellent way the modern model we are using in teachers' in-service training. As a matter of fact, several applications of learning could not be realized or they would be very difficult to carry out without ICT or open learning environments. The fact is that the demands of teacher's work and the pressing nature of it may often limit the possibilities to attend face-to-face training. OLEs make it possible to study and work with projects without the limitations of the time or the place. The training that is not limited to time nor place is however not the main reason to the use of OLEs. The most important reason is the method of learning, examples being collaborative learning and research based learning which can very easily be implemented with OLEs.

The traditional working model of the school has not supported the demands of the Information Society. It is necessary to move on from the traditional working model towards the culture represented by real world (living life). The construction of new information, the evaluation of information and sources and the use of information as a tool will be the most essential part of education. In several professions the modern expertise and know-how presuppose an ability to use ICT and ability to construct new information and to use information. Open learning environments and proper use of them offer schools very good possibilities to develop the education all-inclusively.

Most of the OLEs have a property to make thinking and the problem solving process visible. Thinking can be made visible by writing texts, drawing schemes or charts. It is possible to present ones ideas and hypothesis and other users can comment on them and ask questions. After that the second version of the text can be written based on the comments, and be published on the OLEs and the writer can have even more comments. The whole developing or problem solving process will become visible and also other users can learn by observing it. Interaction with colleagues, instructors, experts and the whole community of the school plays a significant role in development of education.

The open learning environments and their pedagogically meaningful use are the key factors to the challenges and demands of Information Society and open classroom. The use of OLEs facilitates the transformation of learning (and thinking) into a profound process and to a collaborative activity. The direction is from traditional working models towards research based learning and the real development of dynamical expertise. OLE is not restricted only in the classroom or the school, it openly extends to various fields of science and to the whole society and the world.

Case: Information Strategy for the Educational Use – Done by Collaborative Work

The Finnish Ministry of Education presumes that every Finnish school creates its own strategy for the educational use of ICT. The National Board of Education is funding training programs to guide this work. In the ICT Learning Centre we have planned a training program in which a group of teachers from a school creates the strategy collaboratively with other teachers of their own school and other groups of teachers in the same training program. It is expected that the head master, IT-teacher and one to three other teachers participate from a single school. The team will work together on face-to-face lessons and during a distance period they are responsible for taking their own school community to work with them by informing and dividing tasks and duties. At the same time there are eight to ten other teams from other schools working on the same subject. There is an open learning environment to use for all those teams. In the open learning environment all the material the instructor has done is available (for example tools for the development process), as well as plans, ideas, learning tasks and etc. from each team. Every participant is able to access all workspaces and comment on the work of other teams. It means that every team can use and improve the ideas of the others and so the teams don't have to invent things that another team has already developed.

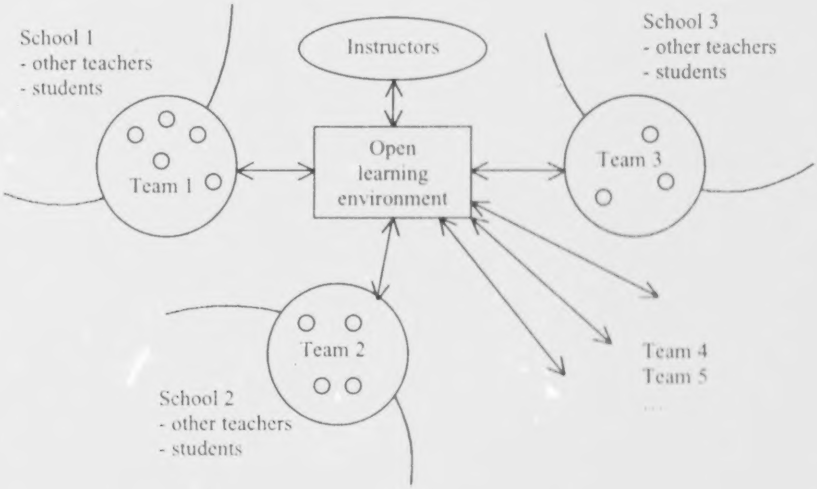

Figure 1: Collaborative model of constructing Pedagogical Information Strategy for the Educational Use

The course of three credit weeks consists of three parts: four day face-to face lessons, learning tasks done in advance and during the course and the project work: planning of the strategy and its execution plan. All the work is done on the open learning environment by the team. There are no individual tasks; work is done collaboratively and the whole team is responsible for the results. The first task is to map the situation of the school at this particular time. It means that the team or its authorized group at school have to collect the facts about the ICT equipment and personnel's knowledge about software and its use in teaching. Because there are some teachers who wouldn't like to use computer in their teaching, it is important to discuss also about the attitudes, fears and threats and to give everyone a possibility to be heard. That way it is easier to make a big change in working community.

First there must be a discussion of values; what is the information and the skills of ICT the students need in their future. It is also important to discuss and agree on the concepts like ICT, the pedagogical use of ICT, open learning environment etc. that are needed to create the ICT strategy. After the discussion the school community needs to decide what are the visions and the goals of using ICT in education. All this can be done in an open learning environment or as an open discussion. The most important part of this work is to write down all decisions and inform everyone.

To get new ideas of using ICT in education during the course every team plans an ICT project to implement with students, carries out the plan and describes the experiences on the open learning environment. Many of the teams have planned a project where students study some new entity using learning environment. This way teachers also get an idea of how to guide and tutor on an open learning environment when they themselves are students in the course using an open learning environment.

The most essential matter in this kind of training is the collaborative process. When every member of the school community has a possibility to take part in creating the strategy and all work is done together, everyone is motivated to carry out the strategy in their own teaching. In the strategy there must be plans on how to train ICT and its pedagogical use to teachers, how to organize the technical and pedagogical support in a school and how to apply an open learning environment to teaching and learning. It is not so important to emphasize an individual teacher and his knowledge but the knowledge of the whole school community. The point is to facilitate all students to get the ICT skills needed in the future and the possibilities they have in improving their learning.

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EdTech Online (ETOL): A Master's Degree Program in Educational Technology

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Abstract: This paper describes an educational technology online Master's degree program at Florida Gulf Coast University. The Curriculum & Instructions M.Ed. graduate program provides both educational and technology experiences for educators who are interested in using technology to support the learning process. A rationale is provided for distance learning. The target audience is defined. A rationale for the selection of courses is provided, faculty support, selection of student, and features of the program. Student and program evaluation techniques are discussed.

Introduction

Florida Gulf Coast University, founded in 1991, is the tenth institution in the Florida State University System. The approximate enrollment is 2,700 with a faculty and staff of 500. The campus is located in Southwest Florida on 760 acres of land. The mission statement of the University encourages the use of distance learning, and the Strategic Plan of the University states that FGCU will develop 25% of its enrollment using distance learning.

The M.Ed. in Curriculum and Instruction with a specialization in Educational Technology program (EdTech) began in 1997 when the University opened. The EdTEch program offered 50% online courses and 50% face-to-face courses. The two three-week summer Tech-Ins offered 18 hours of course credit. Students completed the program as a cohort in 13 months.

Evaluation of the existing program demonstrated that students are successful with the online courses. Faculty in the college have experienced success with online learning, and the university supports training and support for online delivery of instruction. In order to support the Strategic Plan of the University and to provide more students with increased opportunities and flexibility, the current program will be offered as a 100% online program.

Online Distance Learning

Online distance learning courses have become an important facet of curriculum at many universities (Robertson & Stanforth, 1999). Schools are increasing their distance learning opportunities through the use of web-based technologies (Moran & Myringer, 1999). Colleges and universities are embracing online distance learning as a means to increase accessibility to many of their courses and programs (Phillips & Peters, 1999, Blumenstyk & McCollum, 1999). The increase in home computers and access to the Internet has expanded the potential student population (Dunn, 2000). If increased accessibility is the goal of colleges and universities, it is important to ensure that they are meeting the needs of all learners through online distance learning, and not excluding large portions of their potential population.

Some of the reasons to support the ETOL program at FGCU included:

- Online/distance leaning is one of the major missions of Florida Gulf Coast University.
- One of the goals of the EdTech program is to learn about distance learning.
- EdTech students have the necessary skills and computer power to successfully learn online.
- The hardware and software technology for distance learning is improving and becoming more affordable.
- Software packages such as WebCT support higher quality distance learning activities.
- FGCU's support system for distance learning is in place and is improving.
- COE has faculty who are knowledgeable and supportive of online learning.
- Online programs have the potential to earn significant FTE.
- Research exists to support quality learning online.
- Thousands of courses exist using WebCT. Some courses are at the pre-college level
-

Some of the issues facing the College as an online program is developed include:

- Online courses require careful planning for a quality experience.
- The content of technology courses changes often and requires frequent updating.
- Some students require face-to-face learning and live social interaction.
- Live classes may be more fun for both instructor and student.
- Some courses are more appropriate for distance learning than others.
- Intellectual property rights and faculty load issues need to be addressed.
- Faculty need to be trained to provide quality online experiences.

Target Audience

Students enrolled in this program fall into four broad categories:

- Classroom teachers who want a Master's degree that emphasizes technology.
- Classroom teachers who want to become Ed Tech Specialists at school or county level.
- Computer trainers who want to increase computer and pedagogical skill.
- Those with undergraduate degrees who want to learn about technology in education

Sub categories include:

- Level - kindergarten through college.
- Subject area - mathematics, art, elementary education, business
- Physical location – Anywhere in the world.
- Computer background – Minimum computer skills to computer science degree
- Intensity - part time to three courses per semester.

Student Learning Styles

Researchers in the field of distance education examined effectiveness, student motivation, student attributes and traits, student perceptions and attitudes, and interaction. Most of the research did not examine online distance learning, but focused on other forms of distance education (Russell, 1999). Clow (1999) and Sonner (1999) discovered that courses delivered by distance yielded greater effectiveness than traditional courses. Russell (1999) found no significant differences in the effectiveness of distance education compared to traditional education.

Locus of control refers to a student's perception about who is responsible for, or has control over, the events in his or her life (Baynton, 1992; Jonassen & Grabowski, 1993). Tests measuring locus of control provide students with a type of either internal or external locus of control (Dille & Mezack, 1991, Jonassen & Grabowski, 1993). Students with internal locus of control tend to believe that academic success is due to their own abilities; responsibility for learning has been internalized (Dille & Mezack, 1991). Individuals with an external locus of control attribute their academic success to external factors or luck (Dille & Mezack, 1991). Dille and Mezack (1991) found that students defined as having an internal locus of control completed more in telecourses and performed better than students with an external locus of control. The implications for instruction include providing activities that "capitalize on the external student and challenge the internal student" (Jonassen & Grabowski, 1993, p. 360). These activities include teacher-controlled highly structured instruction, highly cued information gathering, and deductive activities all supported by praise and positive feedback from the instructor (Jonassen & Grabowski, 1993).

Kolb's Learning Styles Inventory (LSI) ranks students on four modes of learning, concrete experiential, reflective observer, abstract conceptualizers, and active experimenters (Dille & Mezack, 1991; Jonassen & Grabowski, 1993; Kolb, 1984). The modes of learning yield four learning styles, converger, diverger, assimilator, and accommodator (Dille & Mezack, 1991; Kolb, 1984). Implications for instruction include providing learning opportunities for all four types. Convergers prefer technical tasks to interpersonal issues, whereas divergers prefer activities of information gathering and imagination (Dille & Mezack, 1991; Kolb, 1984). Kolb (1984) stated that assimilators learn best when directed by theory, and accommodators work best while carrying out plans and being involved in challenging experiences (Dille & Mezack, 1991, Jonassen & Grabowski, 1993; Kolb, 1984).

The Student Learning Styles Scale (SLSS) was developed and refined by Grasha and Riechmann (Grasha, 1996; Jonassen & Grabowski, 1993). The SLSS classifies students in six categories, competitive, collaborative, avoidant, participant, dependent, and independent (Grasha, 1996; Jonassen & Grabowski, 1993). Grasha (1996) suggested that the six categories represent three dichotomous relationships, competitive-collaborative; avoidant-participant; dependent-independent. Grasha's research (1996) discovered that learning styles may be dependent on or influenced by course structure. Implications for instruction include providing a variety of learning opportunities to meet the learning styles of all learners (Grasha, 1996; Jonassen & Grabowski, 1993). Extensive research on learning styles shows some correlation between particular styles and success in different classrooms, with different instructors, and in different majors (Dille & Mezack, 1991; Grasha, 1996; Jonassen & Grabowski, 1993). Much of this research has been conducted on distance learning involving telecourses (Dille & Mezack, 1991; Institute for Higher Education, 1999; Russell, 1999). Online distance learning research is limited in scope and depth (Institute for Higher Education, 1999; Russell, 1999), due to the limited history of online technologies.

Student motivation has been studied on two levels, motivation to enroll in the class and motivation to complete the course. Motivation to enroll in distance learning courses included all-hours accessibility to learning, choice and variety of classes, and flexibility of location (Rodrigues, 1999; Rowntree, 1992; Saba & Shearer, 1994). Internal motivation for course completion was a key factor in successful completion of many distance courses (Ehrman, 1990; Kinzie, 1990; Schrum, 1998).

Verudin and Clark (1991) examined several traits and attributes that affect student performance in distance learning courses. These attributes include values, attitudes, and self-concept of the learner. Dille and Mezack (1991) evaluated additional factors that impacted student performance in telecourses. They discovered a positive correlation between grade point average and earned credit hours and final course grade. Dille and Mezack (1991) also discovered that older students received better final grades than younger students received, and married students fared better than divorced students did. Several researchers examined student perceptions and attitudes. Most research found that students completing the distance learning courses were satisfied with their learning experience (Inman & Kerwin, 1999; Phillips & Peters, 1999; Teh, 1999). Inman and Kerwin (1999) found that lack of direct interaction with the instructor did not negatively impact student perceptions or attitudes regarding course effectiveness and delivery. Dillon, Gunawardena, and Parker (1992) concluded that distance education students were positive about their interaction with the instructor and other students. Researchers reported that students preferred greater control and responsibility of their learning (Schrum, 1998).

Electronic Portfolios

The portfolios are developed and maintained in an online format, making them available to professors, students, and employers for the duration of the program. Portfolios are employed as a capstone project, an alternative to comprehensive examinations. The portfolios are developed throughout the program, and the final product is used to evaluate student knowledge gained in the coursework. The students have FTP access to their portfolios throughout the program. They can update the portfolios anytime, and faculty can examine the contents and page design and layout. The students can use the online portfolio as a professional resume. The university can use the portfolios for marketing the ETOL program.

Program

The EdTech program is designed to provide students with a theoretical foundation and the practical skills required for developing curriculum and instructional materials, in a specific area of concentration and for a variety of settings, from pre-school through adult education. The EdTech program concentration is designed to enable students to (a) provide leadership in applying information technology to a variety of educational systems; (b) provide in-service education and basic technical support to teachers and instructors who wish to use technology in curriculum and instruction; (c) assist in curriculum development that integrates technology as a tool for learning; and (d) design and implement courses in computer applications, literacy, and programming.

Degree Options

The M.Ed program is specifically designed for those who already possess Florida teacher certification, while the M.A. program is designed for those who are neither currently seeking nor intending to seek Florida certification.

Entrance Requirements

Students entering the program are required to have a Bachelor's degree from a regionally accredited university.

GPA and GRE or MAT are considered for admission. Letters of recommendation, an e-mail interview, and a self-assessment will determine student qualifications for DL.

Required Courses

Required courses in the degree program core (17 hours):

EDF 6215	Learning Principles Applied to Instruction	4
EDF 6432	Foundations of Measurement	3
EDF 6481	Foundations of Educational Research	3
EDF 6606	Socio-Economic Foundations of American Education	3

Required courses in the concentration (21 hours):

CGS 6210	Microcomputer Hardware Systems for Education	3
EDF 6284	Problems in Instructional Design for Microcomputers	3
EME 6930	Programming Languages for Education	
	(This three-credit-hour course is repeated two times: VB and ASP)	6
EME 6936	Application of Computers as Educational Tools	

(This three-credit-hour course is repeated three times:
Web Design, Integrating, Special Projects) 9

Special Features

Develop Student Care Package: (Sell through Bookstore.)
  Guidelines for online learning
  Books to read
  Organizations
  Web Sites
  CD ROM
Electronic Portfolio
WebCT consistency of courses
Quality Faculty
ASP Interactive support
Encourage Learning Teams
Integration of Courses
Technology Emphasis in all courses
Any order
Flexible
Distance Learning Self-Readiness Assessment
Technology Skills Self-Assessment Survey
Online tracking
In order to compete with other online programs, we will have to build QUALITY.
We need to shift from "experience-based" learning to "performance-based" learning.
Online focus group for feedback

Schedule

Nine courses are offered only once a year, but three courses are offered each semester. The Social Foundations/Research/Special Projects block would be taken during the student's last semester. This Foundations/Research/Projects block of 9 hours could be an integrated online synthesis with a team of faculty working with the students. Online teaming with WebCT is a natural. Multiple instructors could interact with students. Online faculty teaming would be a unique feature of the program.

Fall:	**Spring:**	**Summer:**
Instructional Design	Simulations with VB	Hardware/Networking
Integrating Computers	Curriculum & Instruction	Multimedia on the Web
Web Programming	Learning Principles	Measurement
Social Foundations	Social Foundations	Social Foundations
Research	Research	Research
Special Projects	Special Projects	Special Projects

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Innovative Program Design & Instructional Methods for Online Teacher Education

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Abstract: Can faculty views about internet-based online courses and degree programs change from skepticism to acceptance, and from opposition to cooperation in less than two years? This paper reviews the development and institutionalization of two 100% online teacher education degree programs at Webster University (St. Louis, MO, USA). The number of course offerings grew from one pilot online course in Spring 1999 to 14 in Spring 2001. This success is attributed to program developers' efforts to understand the institutional climate, select suitable program directions, and design online instructional methods congruent with those program priorities. The applicability of Webster University's solutions to online program development efforts at other colleges and universities are discussed.

Introduction

Two years ago, 100% online (Internet-based) courses were non-existent in the School of Education at Webster University (St. Louis, MO). Faculty were skeptical about offering online courses or degrees. The University's administration was also unwilling to commit new funding or resources to the online initiative. Today, the School of Education boasts two successful online Master of Arts in Teaching degree programs. Increased faculty interest in teaching online and high expectations about these courses have supplanted the skepticism. With the online programs now integrated into the University's operational infrastructure, administrative support for online programs is now a given. This paper traces the development and institutionalization of the School of Education's online programs. The successful institutional integration of Webster's online programs may be attributed to the program developers' attention to three dimensions: (a) the organizational climate, (b) curricular and program directions and (c) instructional methodologies. The innovative strategies for each dimension are discussed. With many other institutions starting online programs, Webster's case narrative here may be instructive in their efforts to chart a meaningful program development direction there.

Webster University / School of Education overview

Webster University is an independent, comprehensive, multi-campus University with an enrollment of 17,000 students worldwide and a home campus in St. Louis, Missouri. Its extended campus network consists of 80 locations in the U.S., Europe, and Asia. The School of Education is one of five academic units within the University, with an enrollment of 1,100 in St. Louis, River Heritage & Kansas City, Missouri. Eighty percent of enrollment is in the graduate programs, including the Master of Arts in Teaching and the Education Specialist degree programs. The School also offers the Bachelor of Arts degree. In addition to the degree programs, it offers programs that lead to Missouri Teacher Certification and Missouri Administrator Certificates.

Progress of online School of Education Programs

The School of Education began offering 100% Internet-based graduate courses in the Spring 1999 semester. New online courses were added each semester. The coursework for two Master of Arts in Teaching degree programs, ("Educational Technology" and "Multidisciplinary Studies") may now be completed entirely online.

The School of Education was a pioneer for Webster University in offering among the first 100% online courses and was the first to receive approval for entire degree programs to be offered online. The instructor and student experiences in a pilot course in Spring 1999 were used to assess whether to proceed in further online program development. The pilot course was a success for the instructor.and the 15 students alike. Student evaluations of the course was superlative, and the instructor assessed that course objectives were fully achieved in the online format.

	Courses	Sections	Newly Developed	New Online Instructors
Spring 1999	1	1	1	1
Summer 1999	2	3	1	2
Fall 1999	3	3	2	1
Spring 2000	6	6	4	5
Summer 2000	5	5	5	2
Fall 2000	7	10	4	3
Spring 2001	15	15	9	7
Totals:	39	43	26	21

Table 1: Number of online courses, sections & instructors (SP 99 – SP 01)

Subsequently, the online offerings have increased (See Table 1.). New courses have been added every semester since the pilot. Some courses had multiple sections. As new instructors are added each semester, there are now 21 different instructors teaching 39 different courses online. The enrollment total has exceeded 600 students.

Faculty Concerns

There were several reasons for the prevalent campus-wide faculty skepticism and opposition: (1) Many believed online courses were impersonal simply because the familiar face-to-face interactions were not present. Online courses were hence viewed to be in conflict with Webster University's mission statement that emphasized "student-centered" approaches and "personalized learning." (2) Faculty did not know how effective online courses were: Would students learn as much in online courses as they do campus courses? (3) Faculty were concerned that teaching online would be too taxing on individual instructors and on other campus programs or projects. They believed the time required to learn how to teach using this medium and extra time needed to teach the courses were unreasonable. They were concerned that online effort would take greater importance than existing programs, and therefore compete for money, time and other resources. Some faculty feared that online teaching would become a new criterion for evaluation. Some opposed it because they themselves were not interested in teaching online.

It was important to recognize the intensity of the faculty opposition to the online initiatives. The motivations and reasons for the opposition were both philosophical and emotional. Advocates and developers of the online courses were outnumbered. This meant that a cautious approach was necessary. In this climate, the potential for a devastating backlash was ever present.

Priorities in Program Development and Instructional Methods Development

The intense faculty skepticism necessitated planning and development strategies that did not compete with existing programs and University resources, and did not threaten faculty interests. It would be ideal if both the program development process and the results and products were beneficial to all involved, especially faculty and students. The program developers even hoped that the experimentation and development process itself would eliminate the threats, uncertainties, and problem issues. If the experimentation and development proved successful, additional faculty support was still required for faculty curriculum committees to approve the online courses and programs for the curriculum. The faculty concerns played a significant role in shaping the online program development priorities. These priorities in turn supported the development of the new online instructional methods. (See Table 2.)

Faculty Concerns	Program Development Priorities	Instructional Methods
1. Too impersonal for Webster's mission?	• Increase time / place flexibility • Reject tutorial, self-paced approaches • Stress high instructor involvement	• Threaded discussions • Peer critique • Self-reflection
2. Are online courses effective?	• Select instructors, courses and methods wisely • Document, assess and report results of online experiences	• Instructors' motivation to create effective designs • Improved writing observed • Student work comparable to work in campus courses • Strong norms for quality
3. Too taxing to faculty and other programs?	• Voluntary faculty involvement • Faculty stipends, training & support • New student audiences • Faculty development	• Multipurpose funding • Instructor templates and tools

Table 2: Relationship between faculty concerns, program development priorities, and instructional methods

A. Too Impersonal for Webster's mission?

Like the faculty skeptics, the online course developers were committed to advancing the university's mission to provide "student centered" approaches and "personalized learning." The online initiative should cease if the format or instruction in these courses did not lead to *more* personalization. Program development efforts were therefore shaped by this guideline. Resulting curricular and program directions included:

- 100% Online Courses: Courses taught entirely online, and without any required on-campus classes increased flexibility for students in both time and geography. Students could participate in the course within wider time frames from home, school, office, or from a hotel room if they are traveling.
- Asynchronous: Removing any specific meeting time for classes also increased time flexibility for students.
- Rejection of self-paced tutorial format: It was important to keep the instructor involved and "visible" throughout the online course experience as a means of increasing the sense of personal contact.

Instructional methods that resulted from the attention to personalization include the following:

- Threaded discussions: Students value the interaction in campus-based class discussions. This is mirrored in online courses through threaded discussions, and occasional "chat" sessions.
- Peer critique: Students appreciated the peer critiques online because the record of the written feedback allowed for later review and reflection.
- Self-reflection: The written format of online course enabled students to review the material and reflect on the value of the process as well.

Online courses may be viewed as more personalized when it increases convenience for the students and affords them more flexibility in time and place. Some students find the online experience itself highly personalized because there may be greater opportunity to share one's experiences, read about others' and be heard in the threaded discussions. Others may not value this in the same way because they do not experience the written communication as personal enough.

B. Are Online Courses "Effective?"

How much learning occurs in online courses compared to campus-based courses? Are online courses merely "watered-down" seconds? Aren't students too passive in online courses to learn much at all? These questions reveal the importance of (a) choosing instructors, courses and instructional methods that have the greatest potential for success and teaching-learning effectiveness; (b) documenting how students experience online courses that our faculty teach; (c) assessing learning in both campus and online course; and (d) communicating the results of these assessments to faculty. Regularly updating the faculty is also beneficial in raising awareness about what are online courses and in correcting misconceptions or faulty assumptions about them.

These program development guidelines had the following effects on instructional methods:

- Instructors known for their effective or excellent campus teaching are among the best candidates for online teaching. "Excellent" instructors are likely work conscientiously to shape their teaching methods to also be effective online.
- Instructors seemed more motivated to develop new teaching methods when they or their courses were selected for online delivery because of the potentiality for teaching-learning effectiveness.
- Instructors have observed improved writing among students within the semester in online courses.
- Instructors report the quality of student assignments to be comparable to that in campus courses.
- There may be a stronger norm in online courses to produce quality work when the instructor requires some assignments to be shared among class members.

How much learning happens in an online or campus course is contingent on many factors including the instructors and their aims, priorities, skill and experience, as well as the course topics selected and the teaching methods employed. It appears unlikely that the online medium per se is the most significant factor in learning effectiveness. Finally, it may be just as important to communicate this conclusion to faculty in the department and across campus.

C. Too Taxing to Faculty and Other Programs?

Opposition to the online initiative may have been strongest when it was viewed as competing for priority, personnel, time, and resources. The absence of extra or special funding for the online initiative may have helped reduce the perception of inequitable distribution of resources. For the online initiative, it did mean experimentation costs could not exceed existing operating budgets. Given strong faculty sentiments, it was not possible to redirect funds already committed to departments and programs. There was some flexibility in some small grant (soft money) projects to multi-purpose some of the project objectives. For example, in a funded project to develop professional teacher networking across several school districts, the electronic communication tools designed for use in the teacher collaboration could also be used for collaboration and teaming activities in the online courses. Many of the experimental instructional designs for online courses could be supported in this manner.

It was important to reassure faculty that online teaching was voluntary. No new expectation or requirement for faculty to teach online was being advanced. Evaluation of those who teach online involved the same criteria as those who teach campus courses. The impact of a voluntary online faculty, meant involvement of highly motivated instructors, which contributed to the strength of the courses. Also, with reluctance among full-time faculty to teach online, a strong pool of adjunct faculty teaching for online courses emerged.

Faculty concerns about significant learning time and preparation time for online courses were addressed by: seeking new instructor stipends for online teaching and providing specialized training and instructional design support for instructors. Instructors participate in a short-term training sequence to introduce them to the online tools and to course design issues. The tools and templates are especially helpful in shortening the time instructor might spend preparing the course, organizing activities, and grading assignments. Technical support is available to instructors throughout their course development period and through the duration of their course delivery. The strength of the support is its quick turnaround and response to problem solving provided by two staff members assigned to the online programs.

The threat that the online courses would "steal" students from existing programs was not realized. There was an immediate increase in new student enrollment when the online courses were launched. Also, it was possible for students in current campus programs to enroll in an additional online course, because of the time flexibility, whereas they would not have been able to schedule another campus course. This pattern also validates the program developers' decision to increase time and place flexibility.

As more instructors volunteered to teach online, and benefited from the support, the time-saving tools and templates, and new stipends, many realized the personal value of the experience. Teaching online, for most first time instructors, was an opportunity to learn about the technology, about teaching, and about their own teaching skills. Instructors have expressed the value of discovering new ways to organize a course, and how valuable this is in teaching both campus and online courses. Many faculty now view teaching online as an arena for their own learning and professional development. For them, these results are well worth the extra hours spent developing their skills.

Discussion

Two kinds of generalizations may be made from the School of Education's successful launching of its online programs: (a) Other institutions starting online courses may benefit from Webster University's case; (b) Some elements of the process may be instructive for other program innovations at Webster University or other institutions.

Like the Webster faculty, other university and department faculty are likely to be divided in their views about establishing online courses and program. Strategies used at Webster that not only reduced opposition, but also won the cooperation of faculty colleagues are probably applicable to many situations. Expanding the employment of qualified adjunct faculty when full-time faculty opt not to teach online (or whatever is the program innovation) is effective in building the programs and minimizing unwanted pressure on full-time faculty to participate.

While few universities share the multi-campus presence and organizational infrastructure, many departments, colleges or universities face similar budget and human resource limitations that the School of Education faced. It may be helpful for advocates of any innovation to view some lack of funding as an asset in reducing the resentment, sense of inequity or even hostility toward the innovators. "Multi-purposing" special projects appears to be an effective strategy when used for other program development goals in the context of frozen or restricted budgets.

When faculty have misconceptions or strong negative bias about other innovations, concepts or change being advanced, it makes good sense to document and collect assessment data, which can then be distributed to begin clarifying incorrect assumptions and biases.

Conclusion

It is likely that exploring any innovative curriculum such as this online initiative inevitably begins in a context of skepticism and opposition, as it did at Webster University's School of Education. Some of the strategies in program development and instructional methods employed in this case seemed unexpected or counterintuitive when taken out of context. In retrospect however, the choices made and the process followed were sensible and meaningful. We do not know if the association between these decisions and the success of the online programs or the change in the faculty climate was coincidental or germane. It is also speculative whether applying these factors to other situations would lead to similar success. Perhaps the more important lesson lies behind the individual factors discussed above. The underlying *process* may be more essential. This process was: to listen carefully to the voices of opposition; to understand and acknowledge them; and to provide creative but genuine and meaningful institutional responses to them. The resulting program directions and instructional methods will differ in every case where this process is used, but they are likely to be the most appropriate and, let's hope, successful direction for that innovations.

A Graduate Track in Learning Technologies

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Abstract: A graduate level specialty track in learning technologies was approved in 1998 in the College of Education at Florida International University. It is offered as a track under the Master of Science in Urban Education degree program. The first group of students enrolled in the program during the Spring 1999 semester. This paper provides an overview of the

program, including comments made by students who will have graduated by the time this paper is published.

Introduction

The College of Education at Florida International University in Miami, Florida has been offering a Master of Science in Urban Education degree program for a number of years. In response to a perceived need, a specialty track in learning technologies was proposed in 1998, and was approved and added to the urban education degree program in the same year. The District Director of the Division of Instructional Technology and Media Support Services of the Miami-Dade County Public Schools (M-DCPS) provided a letter in support of proposal to start the program. A majority of the graduates of the College of Education teach in the Miami-Dade County Public Schools, which is the fourth largest school district in the United States. Many of the students enrolled in the learning technologies specialty track teach in the M-DCPS. The purpose of this paper is to provide an overview of the learning technologies specialty track. Excerpts from written comments submitted by students who were enrolled in the program at the time this paper was written are also included.

An Overview of the Specialty Track

The College of Education at Florida International University places a great deal of emphasis on learning technologies, as indicated by the following statement that appears in the strategic plan developed by the faculty of the College:

> The teacher of the 21st-century must be as comfortable with technology as a learning tool as he/she is with the chalk board, textbooks, etc. Teacher education institutions must therefore play a vital role in the preparation of such kinds of teachers and other school personnel (Florida International University, College of Education, 1996, p. 11).

As stated in the document *Technology and the New Professional Teacher* (National Council for Accreditation of Teacher Education, 1997)

> Classroom teachers hold the key to the effective use of technology to improve learning. But if teachers don't understand how to employ technology effectively to promote student learning, the billions of dollars being invested in educational technology initiatives will be wasted (p. 1)

The purpose of the specialty track in learning technologies is to make educators, especially classroom teachers, comfortable with the idea of using various technologies to facilitate learning, teaching, and professional development. As their comfort level grows, students in the program also become capable and knowledgeable about how to use various technologies in their own classrooms, and to further their own professional development. Extensive knowledge of or proficiency with technology is not a prerequisite for admission into the program. However, by the time students are ready to graduate from the program, they will have developed sufficient technological expertise and gained adequate knowledge to enable them to use various technologies in educational settings.

The beliefs upon which the master's degree program is based are as follows:

1. Technology is not an end in itself, but a means to an end, the end being learning.
2. All students, irrespective of their social, economic and ethnic backgrounds can learn with the help of technologies such as computers, CD-ROMs, videodiscs, the Internet, and the World Wide Web (WWW).
3. Given adequate experiences and opportunities, all students (males and females) can learn equally well with the help of various learning technologies.
4. A 'hands-on' approach to preparing teachers to teach with technology will better equip them with the skills to facilitate learning in technologically rich classroom environments.
5. Teachers who are encouraged to reflect upon and continuously improve their practice will discover better ways to use learning technologies to facilitate learning in the classroom.

The beliefs upon which the proposed program is based, are in turn based on the following assumptions:

1. Technologies will continue to change at a rapid pace.
2. The availability of learning technologies in K-12 schools will continue to increase.
3. The potential that advanced technologies have for facilitating learning will also increase.
4. Learning technologies will be used in schools in fair and equitable ways.
5. Newer and better technologies will become available in the future.
6. Teachers will have the freedom to experiment, explore, and discover new ways of facilitating learning using technologies.
7. Teachers who are taught using a 'hands-on' approach will develop positive attitudes and become more confident in utilizing technologies to facilitate learning in their classrooms.

In order to graduate from the program, students have to complete 36 hours of coursework, including 18 hours of coursework in the area of learning technologies. The other 18 hours of coursework consists of core courses that are a part of the Urban Education master's degree program, and consist of courses in research and foundational graduate level courses in education. If students take two courses a semester, they can complete the program in six semesters or two years, including summer sessions. In addition to making students more comfortable with technology, the program also provides them with a strong foundation in research.

A Hands-on, Project-Based Approach

The learning technologies courses in the track are taught using a hands-on, project-based approach. All the learning technologies classes have so far been taught in computer labs. Assuming that computer labs are available in the future, such classes will continue to be taught in computer labs where each student has access to a computer. Students work individually or with others to complete various projects, that sometimes involve creating products and at other times result in presentations. They are also given the option of gearing the content of their projects towards the grades and the subject areas in which they are interested. A student stated, "I have engaged in many hands-on projects that I was able to create specifically for my teaching discipline. I feel the major advantage has been the ability to actually complete projects using technology and take them back to the classroom." Another student noted, "Creating projects gave me a clearer picture of what I should be doing with my students to help increase their motivation and learning. I have seen that there is so much available to help teachers and students. Participating in this learning technologies track has helped me see how important it is to expose students to a tool that will enhance their learning, and how I can become a change agent in helping other teachers to integrate technology in their classrooms as well." According to a third student "The most important skill I have received from this unique program is the project-based learning, the hands-on experiences."

Instructor is a Facilitator

The theme that defines the College of Education (COE) at Florida International University (FIU) is stated as follows: "The Professional Educator and/or Related Professionals as Facilitator of Learning and Change Within Diverse Populations and Environments" (Florida International University, College Of Education, 1996, p. 28). The theme implies that "the graduates of any program in the College should be disposed to view teaching as the act of being a facilitator of student growth rather than a source of information to be learned" (Florida International University, College Of Education, 1996, p. 28). The College's stated theme suggests that the emphasis of proposed master's degree track should be on a facilitative approach.

The learning technologies courses that are a part of the specialty track have been taught up to this point in time using an approach that can be best described as a facilitative approach. The instructor acts as a facilitator, setting the stage for learning. The instructor plays the role of a 'guide on the side' rather than the so called 'sage on the stage.' In this approach, the instructor is in charge and in control of the course at the beginning of the semester. Slowly but surely, students begin to get more involved in the course and in their own learning. Students are encouraged to share ideas and resources with each other in all the learning technologies courses. According to one student "The courses are designed to build confidence, allow for sharing of information and knowledge regarding practical applications for the use of technology in the classroom."

Some Challenges

Adequate technology resources are not always readily available. Even when such resources are available, they are not available for use during class. Since many of the students in the program are teachers, the learning technologies classes for this program are generally offered in the evenings. Since the offices on campus that provide technology support services usually close at 5:00 p.m., it is sometimes difficult to get access to the necessary resources during class hours. It must be pointed out that many of the staff members who work on campus in offices that provide technology support services, have been extremely helpful to and supportive of students enrolled in the learning technologies track. On a couple of occasions, the university support personnel have even stayed in their offices a little late and taken the time to demonstrate technologies to students.

At this point in time there is only one full-time faculty member who is responsible for teaching many of the learning technologies courses in the track. One or two other faculty members have occasionally taught courses in which students from the track have enrolled. However, such help cannot be taken for granted since these faculty members have other responsibilities and may not have the time to teach learning technologies courses every semester. Since the learning technologies program is relatively new, and the student numbers are growing at a slow pace, the college cannot justify hiring more faculty members until the program grows some more and becomes larger in terms of student enrollment. This situation will hopefully improve as more teachers become aware of and enroll as students in the learning technologies program and as the college hires more faculty members.

Future Plans for the Specialty Track

A few prospective students have called and expressed a need for online offering of some of the courses within the specialty track. When more resources, especially personnel resources become available, some of the courses will be offered partially online. This will make it more convenient for teachers in M-DCPS and other nearby school districts to pursue the program.

It would also be nice to have dedicated lab space for use by faculty and students in the learning technologies specialty track. The availability of such space and equipment would make it possible for students to learn more about various technologies that can be used to facilitate learning, teaching, and professional development.

Conclusion

The learning technologies specialty track is a small but steadily growing program. It is also a relatively new program. Initial indications are that the program is beginning to make an impact, albeit on a small scale. One student stated "After two years in the LT program I have gained valuable information on how to use technology not only in the classroom but also for my own personal use. When I first started I only thought of my computer as a $2,000 deck of cards. . . . Two years later I now feel extremely comfortable using different programs. I am also no longer afraid to try different programs in my computer. While I still use my computer to play cards that is only while I'm waiting for my information to be downloaded." As another student put it, "In my first class, I had to ask the professor how to save a file on a PC Disk. I was a Mac person who had always dragged and dropped files. I had no idea that a mouse had a left side and a right side. Two years later, I can edit movies, create charts, graphs, PowerPoint presentations, Hyper Studio presentations and Web Pages. I have set up an entire distance learning class and a database." There is a need to monitor the effectiveness of the program on an ongoing basis.

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Using Communities Of Practice Strategy To Enhance Mentoring

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Abstract: The current model for mentoring doctoral students is based on apprenticeship; but this process may result in the insufficient development, application and spread of knowledge. Other mentoring models have been proposed, but none have addressed online professional development. Communities of practice (CoP) have the potential to be conducive to mastery of new knowledge. Several successful reform projects have supported this concept. This paper describes a CoP model that combines on-line and face-to-face (FTF) elements designed to enhance mentoring and professional development strategies. The goal is to evolve a sustainable CoP for the graduate education of professionals, learning the intricacies of their profession, implement practices, and apply new content knowledge. This study demonstrates how a CoP model supports doctoral students' learning. It concludes with a discussion of the attributes of CoPs and guidelines for construction of effective mentoring models for learning reforms.

Introduction

The current model for mentoring doctoral students is based on apprenticeship; but this process may result in the insufficient development, application and spread of knowledge. Other mentoring models have been proposed, but none have addressed online professional development. Communities of practice (CoP) have the potential to be conducive to mastery of new knowledge (Lieberman, 1996; McMaster, 1999; Renyi, 1996). Several successful reform projects have supported this concept (National Science Foundation, 1997; Stokes, Sato, McLaughlin, & Talbert, 1997). This paper describes a CoP model that combines on-line and face-to-face (FTF) elements designed to enhance mentoring and professional development strategies. The goal is to evolve a sustainable CoP for the graduate education of professionals, learning the intricacies of their profession, implement practices, and apply new content knowledge. This study demonstrates how a CoP model supports doctoral students' learning. It concludes with a discussion of the attributes of CoPs and guidelines for construction of effective mentoring models for learning reforms.

Communities Of Practice

Quintessentially, "communities of practice are groups of people who share similar goals and interests; and, in doing so employ common practices, work with the same tools and express themselves in a common language. Through such common activity, they come to hold similar beliefs and value systems (Collaborative Visualization (CoVis) Project , 2000)." These groups of professionals are informally bound to one another through exposure to a common class of problems, a common pursuit of solutions, and embody a store of knowledge (Peter+Trudy Johnson-Lenz, 2000). A common sense of purpose and a real need to acquire the knowledge of each other holds these professionals together. Members of CoP collaborate directly, use one another as sounding boards, and teach each other. They are not merely peers exchanging ideas who share and benefit from each other's expertise, but members committed to jointly develop better practices. Thus, developing a "community that learns" rather than just a "community of learners." In fact, many CoPs have occurred naturally in learning and/or working environments.

Three Dimensions of CoP

Three dimensions of CoP, knowledge, community, and integration, are proposed by McDermott (1999).

CoPs, whether spontaneous or intentional, share both knowledge and information. CoPs have both individual and community relationships, and integrate the individual's work in many different ways. They vary a great deal concerning how much they focus on each of these dimensions. Some focus more on sharing tacit know-how and others on explicit information (knowledge dimension). Some build relationships among individuals; others build a common identity (community dimension). Some are tightly tied into people's everyday work; others are distinctly separate from it (integration dimension). By understanding these dimensions, one can determine the kind of learning community that will likely be most effective for a given situation. None of these dimensions are mutually exclusive.

Knowledge

There are many different kinds of knowledge, data, information, tools, procedures, know-how, and understanding. Some knowledge can easily be written down or drawn and made "explicit." Tools, procedures, templates, are examples of explicit knowledge. Other knowledge is "tacit," things known by people, but not documented anywhere. The know-how, understanding, mental models, and insights of an individual or discipline are examples of tacit knowledge. Since explicit information is written down, it can be organized, distributed, and managed. Know-how, on the other hand, includes a vast store of knowledge that people are unaware they possess. To become aware of this knowledge, people often need a problem or issue to draw it out, such as problem-based knowledge building. Know-how is difficult to communicate in a way that is useful to others. It rarely translates well into explicit procedures. In fact, it is often shared through "war stories," observations, reflective discussions, and other person-to-person connections. Understanding which kinds of knowledge a community needs to share is key to selecting the forums, structures and systems that will be most effective.

Community Identity

The second dimension is the strength of the community's sense of identity. This identifies how people participate socially in the community and the boundaries that hold the community together. In a strong community people interact frequently, both individually and as a unit, and share a common identity and purpose. This is a community of practice. In a weak community there is very little interaction, common identity, or purpose. Both extremes and the variations between them can be useful in disseminating learning.

Integrated with the Work

Documenting and sharing knowledge with other communities often feels like an imposition on "real work." Problem solving and applying insights form the core of the work of most communities. It is usually hard for them to step back and document their insights for others or break to solve another communities' problem. Requiring documentation is not a resolution. Even when required, documentation is often seen as an afterthought and frequently does not contain the richness, subtlety, and meaning of the communities' thinking.

When sharing knowledge is naturally integrated with work, people often naturally share ideas and insights without thinking of it as separate from their normal work. When sharing knowledge is seamlessly integrated into work it is unobtrusive.

CoP And Learning

CoP has a strong influence on pedagogical designs (Collaborative Visualization (CoVis) Project , 2000). The concept of CoP can enhance learning in a social interaction environment (Brown & Duguid, 1996; Lave & Wenger, 1991; Wenger, 1998). This concept is familiar to most educators and is based on several educational theories. The focus on learning through "participation" in CoPs is reminiscent of John Dewey's learning by doing. The underlying assumption is that people gain new abilities and knowledge through efforts to attain goals. The second focus on learning through participation in the community is reflective of many efforts, past and present, to bring the social learning and doing, so often found in the workplace, into the classroom. Learning in CoPs includes efforts to integrate collaborative learning, apprenticeship, mentorship, and tutoring as a part of classroom education. The concept of CoP suggests that it is the combination of these endeavors, rather than the isolated application of any one of them, that will allow students the widest access to opportunities for learning (Collaborative Visualization (CoVis) Project , 2000).

When CoP is applied to academia, novices in the CoP must participate in and must be assisted by the community to acquire the goals, values, language, and techniques of practice. Novices and experienced-members are constantly acquiring complex abilities and knowledge through their regular participation in professional, recreational and daily living CoPs (Collaborative Visualization (CoVis) Project , 2000). A key component of becoming a member of a CoP is that learning takes place through working with others toward a common goal. One must have a commitment to continuing learning to be a part of the community. One exceptional technique in learning is to be engaged in teaching others and in developing new approaches to old challenges. Fully participating in a CoP increases the ability to learn individually and also increases the knowledge of the whole community (McMaster, 1999). Debates and contentions are key components that drive community activity and the evolution of that activity over time.

Building Informal Communities

Although CoP is naturally created, it can be fostered. Sharp (1997) suggested several factors to facilitate the development of informal communities. Members of the community should work together, train together, and stay together long enough to provide a fertile environment for the development of CoPs. However, just being together is not enough; personality, judgment of competence, and style need to be included, as well. Therefore, trust, cooperation, friendship and community are essential to community discourses.

FTF interactions increase the likelihood of a CoP developing among members; but they are not required to foster CoPs. Generating occasional social interaction is the key to advancing a CoP. Computer-mediated communication (CMC) is able to deliver social interaction and is; therefore, a viable means to construct CoPs. In building social interaction, trust and mutual recognition of competence, developed over time, are critical to supporting professional groups (especially using CMC) and CoPs. According to Sharp (1997), frequent reassignment or promotion of professionally skilled people may inhibit or degrade CoP development.

Sharp (1997) argued that improved learning would often come from encouraging development both of CoPs and CMC Communities of Discourse. Both FTF meetings and CMC forms are critical to foster CoPs. A CoP can be maintained through supplemental non-FTF forms of communication. Arranging a time, place, and agenda for a FTF meeting can be cumbersome. However, the informal nature of communities and the possibilities of modern technology make the formation of communities easier to accomplish. CMC can help professionals sustain and deepen relationships that they initiate through more conventional channels.

Technological designs exert a strong influence on CoP (Schlager et al., 2000). Several guidelines are proposed to foster CoP through the use of CMC forms: (a) Facilitate and publicize "Schelling Points": Enhance and widely publicize the ability to easily create mailing lists, Web pages, phone lists, online bulletin boards, real-time discourses, and other communication facilities that can support communities of discourse; (b) Seek active support from one or more CoPs when using CMC forms: The more "water-cooler" CoPs using a particular CMC form, the greater the likelihood of a successful sharing of information; (c) Explore the use of "Agent" technology to enhance signal-to-noise ratio, giving participants more relevant messages: Use cognitive (content) and social (rating) systems of intelligent agents to filter information.

Method

Participant observation method with a dramaturgy perspective was used to understand the building CoPs from the student's point of view. The community was composed of eight students enrolled in the Distance Education Seminar, a doctoral level course offered by a university in the Southwest United States, were the subjects. Students were allowed to take from one to three credits. All eight students were enrolled in the course continuously over two years. One instructor served as the coordinator. The group met once a month for two hours. FirstClass, a computer conferencing system, was used for group communication. It provided e-mail, bulletin board, and real-time chat functions.

The data were collected over two-semesters through casual conversation, in-depth interview, direct observation, and document analysis. At the twelfth week of the second semester, four semi-structured in-depth interviews were conducted with students to explore particular concepts in the CoP. Document analysis included all messages delivered on FirstClass and outside e-mail received by group members.

RESULTS & DISCUSSIONS

Several guidelines were generated from the qualitative data analysis.

Determine Community Knowledge

If the community which shares tacit knowledge has a strong sense of identity and needs to integrate new knowledge related to their work, FTF meetings and many opportunities to link together one-on-one via CMC are necessary. The sharing of explicit information (documents already written) that is not vital to the community identity and that does not need to be immediately integrated as new knowledge for the work of the community can be accomplished by the development of community databases that are managed by a select group of community members, such as web-based databases.

Build Important Topics

Organizations frequently cast "too wide a net" and ask teams to share or document too much information. As a result, they end up building stockpiles of underutilized information. To leverage knowledge effectively, communities of practice need to understand what knowledge is strategically important to the communities.

Build Background Context

Sharing insights is not simply a matter of transmitting information from one to another. To be useful, information needs to be translated from the context in which it was developed to the context in which it will be applied. It is in the human interaction that people build enough common contexts to understand each other, enough trust to be willing to share ideas, and enough initiative to draw out the "tacit" knowledge.

Most CoPs have many different kinds of knowledge to share. Since data, information, and know-how travel best in different media, most CoPs need multiple ways to connect and share knowledge. When a community relies too heavily on a single medium it tends to get clogged with inappropriate information.

Pull Insights from Each Other

Most people have had the experience of sitting through long discussions that were not immediately relevant. People learn best when faced with a problem and need ideas to solve it, when they "pull" information currently relevant. Whether using person-to-person forums or CMCs, knowledge sharing should be designed to respond to "pull" rather than "push" information out to people.

If the organization values learning and sharing knowledge, it should provide a rich ground for growing CoPs. But that means people need to give the time and encouragement to reflect, share ideas with others, and think through the implications of others' ideas. Rather than creating a new "program" for sharing knowledge learning, find the networks that already exist, enable them, and link them to other communities.

Conclusions

Community of practice can enhance learning through mentoring. Several factors identified in this study serve as a model for building a CoP for education reform. First, one must to decide what kind of connections to make between learners, to understand what kind of knowledge to share, what kind of community it is inclined to be, and how tightly sharing knowledge needs to link with work. To enhance learning one does not need to create and build them from the ground up because CoPs arise spontaneously in most organizations. However, one needs to identify and nurture them with the resources, structure, and systems they need to flourish. Developing CoPs is closer to husbandry than architecture.

When building communities on natural networks, coordinators must be generated to organize and maintain the community activities, such as building important topics, initiating simple knowledge sharing activities and arranging social activities. The coordinators also need to provide the members with the time and encouragement to reflect, share ideas with others and think through the implications of other ideas. Because communities are organized and supported differently, community development requires a different set of tools and approaches. CoPs often require time to develop. Because they are organic, CoPs need time to find the right kind of information to share, the right level of detail, the right participants and the right forums. Individuals must support the community in making these discoveries quickly; but, since information, level of detail, participants, and right forums will be different for different communities, each community will need to discover their own appropriate forum.

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The Learning Lab: Teaching and Learning In An Online Information Technology Environment

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Abstract: *The Learning Lab* is an online professional development program for teachers who want to upgrade their information technology skills and learn more about integrating technology into teaching and learning. The program is based on self-directed learning. It includes prior learning assessment and development of personalized learning plans as core components of the program. A wide range of learning paths, modules, learning objects, and resources are provided to meet the needs of teachers whose skill levels range from emergent technology learners to education technology leaders. *The Learning Lab* provides opportunities for teachers to work at their own pace, in the curriculum area of their choice, and to apply their research and their learning into the classroom. Offered as both a non-credit and credit program, *The Learning Lab* provides an easily accessible, media-resource rich, mediated model for teacher professional development programs that meets international standards and strives to address key issues in ITC training.

Introduction

The emergence of network technologies and the evolution and rapid growth of the World Wide Web in the mid-1990s has had significant implications for teacher and learner access to information and learning resources. This situation has not gone unnoticed by learners, their parents and the pubic, all of whom are demanding greater access to learning technologies within schools. Since the mid-1980s, access to and use of computer technology in schools has grown rapidly but unevenly. In Canada, successive technology funding programs at the provincial and federal levels have provided schools with access to hardware and wiring but until recently little attention has been paid to the development of appropriate educational content, teacher training, and technology support within schools. As a result, individual teachers often struggle with the implementation of technology due to a lack of curriculum-specific software, training, and support. Of greatest concern to individual teachers and teachers' associations is the lack of training and professional development resources and approaches available that enable educators to successfully integrate computer technology into their practice.

A number of pilot and small-scale attempts have been made in various jurisdictions across Canada and the United States in recent years to address this problem. These pilots indicate that adult training models work effectively with teachers and that the most effective approaches to teacher professional development in the use of computer technology are ones that emphasize contextualized learning. This means, for example, that if one is a social studies teacher, effective integration of technology is likely to occur when the training received by the teacher is connected to the pedagogical and instructional plan that the teacher has within the classroom.

Of equal importance in teacher education is the use of educational models that provides teachers with ample opportunity to direct their own learning within a resource-rich environment. In 1999, the Council of Ministers of Education of Canada published a series of research documents that outlined educational issues and provided a framework for evaluation of teacher education programs in information technology.[1] The issues identified in this research and elaborated in the resulting framework document clearly showed that across Canada teachers were recognizing the need to increase the scope and quality of professional development programs in information and communications technologies (ICT). Primarily, they were looking for contextualized, self-directed, and collaborative professional development models through which they could enhance their ICT skills.

Key Findings That Guide The Learning Lab Program

Key findings about teacher needs with respect to ICT professional development are listed below:

1. Time, within the school schedule, to learn how to use the technology, experiment with the technology, and learn how to integrate it into the curriculum.

2. Proof that technology integration makes a difference in teaching and learning and can be academically justified in terms of improved student learning.

3. Practical "how to" knowledge and first-hand, experience-based skills with respect to using and operating technologies to support teaching and learning.

4. An organized, ongoing, varied program of professional development activities to reach all teachers "where they are at".

5. Time and opportunity for reflective thinking about the place of learning technologies as tools for learning and teaching and about how they change the teacher's role.

6. In-depth knowledge of learning and instructional theories – constructivism, cognitivism, behaviourism, andragogy, facilitation skills, etc.

7. Teachers using learning technologies as students and developing standards, benchmarks, and accreditation processes for pre-service and in-service training with instructional technologies.

8. Access to learning technologies in sufficient quantity and quality that activity can be undertaken within classrooms and with student groups.

9. Ongoing and on-demand access to peers, mentors, or colleague networks where expertise can be obtained and discussion can take place on issues related to pedagogy and/or technology.

10. An organized support system to ensure that school-based technology and networks are serviced or can be serviced with quick response.

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History of the Program

In 1997 the Open Learning Agency (British Columbia) and Simon Fraser University (British Columbia) collaborated on an innovative post-baccalaureate diploma program for teachers that focused on self-directed learning and the use of online resources and interactive collaborations in teaching and learning called *Teaching and Learning In An Information Technology Environment* (TLITE). This 2-year, 30 credit program was innovative as well in the way it utilized local expertise and experience through the development of cohort agreements with school districts, and in the flexible accreditation that was made possible through the use of field-study credits. However, the program was and is designed to work well with a great deal of face-to-face interaction and ongoing local support by school district mentors. As a face-to-face model, the program was extremely popular and was well received by teachers in British Columbia. The number of teachers who were able to participate in the TLITE program was small (fewer than 400), while the number of teachers who needed to upgrade their information technology skills and their professional practice with information technology in their classrooms was large (more than 40,000).

British Columbia is a large, geographically diverse province with the majority of the population concentrated in the southwest corner and the rest distributed throughout the vast interior and mountainous northern regions or along the rugged shoreline with its many small islands. Training teachers in BC is a daunting task. However, we believe that all teachers and students have an equal right to high quality education, with equitable access to resources and technologies. The Province of British Columbia has spent many millions of dollars over the past 15 years in research and development through such programs as the *Community Learning Network*, and in networking all the schools, universities, colleges, and libraries of the province through the *Provincial Learning Network*.

Similar problems are evident across Canada, and the federal and provincial governments are trying to meet the challenges that face Canada's education system. To that end, the federal government through Industry Canada (a federal ministry) has established Canada's *SchoolNet*, Canada's *Campus Connection*, and Canada's *Learnware* programs. *The Learning Lab* is partially funded through Canada's *Learnware* program, as the teacher education component of an experimental educational portal, *The Learning Window*, designed by Ingenuity Works, with partners IBM and Telus.

The Learning Lab takes the lessons learned in the TLITE post-baccalaureate diploma program and applies them to asynchronous, online, mediated, mentored, resource-rich learning for teachers. The teacher may be in pre-service programs or can be practicing teachers who need to upgrade their technology skills or enhance their use of technology in their professional practice. The program focuses on self-directed learning as the learner (teacher) strives to increase competencies in particular areas of either skill or application.

The Learning Lab is built upon the notion that adults prefer to learn in their own way, at their own pace, to meet their own individual needs. It assumes that the prior learning that people bring to the educational experience is valid and provides opportunities for every participant to complete a Technology Self-Assessment Inventory and revisit that self-assessment as often as needed throughout the program. It provides tools and opportunities for participants to design their own learning path, based on their individual curriculum areas, grade levels, and interests. It is designed to meet the needs of a wide variety of learners - from beginning technology users to educational technology leaders. And, it makes used of sophisticated, web-based competency management system to guide learners through their self-designed program of study.

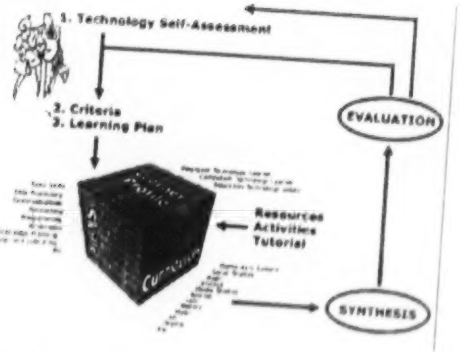
1. Technology Self-Assessment
2. Criteria
3. Learning Plan
EVALUATION
Resources
Activities
Tutorial
Skills
Curriculum
SYNTHESIS

Figure 1.0: *The Learning Lab* - Self-directed Learning Model

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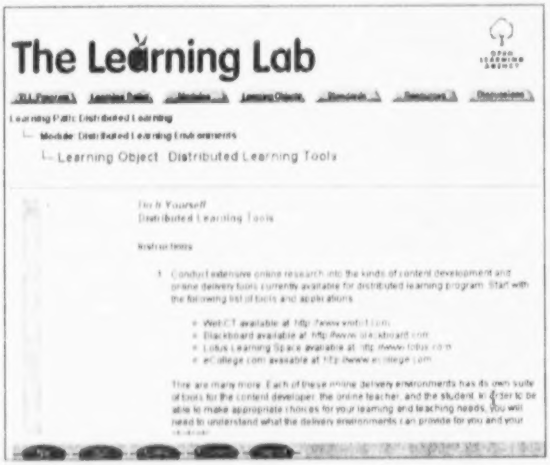
The Learning Lab provides opportunities for participants to address standards and competencies developed by their school districts, states, provinces, or themselves. It provides interactive online tools to assist educators to design their individual learning plans as well as to participate in pre-defined learning plans. It provides ways for participants to demonstrate that they have met learning outcomes for credit through those individual learning plans.

It is based on competencies originally described in the collaborative venture by OLA and Simon Fraser University's Faculty of Education called the TLITE program, as well as on standards defined by the International Society for Technology in Education (ISTE) and accepted by the National Committee for the Accreditation of Teacher Education (United States). It uses those competencies and standards to provide opportunities for educators to increase competence in the use of technology, as a teacher, and as a learner. However, teachers participating in the program will be able to set their own standards, and define their own goals.

An advisory board is being assembled and currently includes two participants from U.S. universities, Mississippi State and University of Georgia. Dr. Lynne Schrum (Schrum, http://www.uga.edu/) and Dr. Larry Anderson (Anderson, http://www2.msstate.edu/~lsa1/) are advising the development and delivery team on educational models, content development, and evaluation of the program.

The Learning Lab content is developed in SGML and XML. The delivery environment is designed using very innovative technologies – a Zope object database on a Linux server.[2] This development provides the Open Learning Agency with a prototype XML object repository using open source tools. The SGML/XML development environment allows us to provide content in the form of granular learning objects, aggregate them to form pre-designed learning paths, or provide them to the users to design their own learning paths.



Learning Path: Distributed Learning
└ Module: Distributed Learning Environments
└ Learning Object: Distributed Learning Tools

Do It Yourself
Distributed Learning Tools

Instructions

1. Conduct extensive online research into the kinds of content development and online delivery tools currently available for distributed learning program. Start with the following list of tools and applications
   - WebCT available at http://www.webct.com
   - Blackboard available at http://www.blackboard.com
   - Lotus Learning Space available at http://www.lotus.com
   - eCollege.com available at http://www.ecollege.com

   There are many more. Each of these online delivery environments has its own suite of tools for the content developer, the online teacher, and the student. In order to be able to make appropriate choices for your learning and teaching needs, you will need to understand what the delivery environments can provide for you and your

Figure 2.0. A Learning Path in *The Learning* Lab is made up of granular learning objects aggregated into modules.

It will be possible for each program participant to get accreditation for the same program using entirely self-designed and unique "course-like" content. The binding factor is the assessment and accreditation tools based on demonstrations of competence that meeting learning outcomes and established competency benchmarks.

The Learning Lab is available online at http://tll.ola.bc.ca.

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Learning to Learn in Online Courses

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Abstract: What strategies do students use to cope with challenges in the online learning environment? Written surveys and verbatim interview transcripts of 94 online learners in five online graduate courses were analyzed. Students describe a variety of metacognitive, motivational and social strategies tailored to the online environment. These strategies include goal-setting, pacing, planning, notetaking, summarizing, self-monitoring, early navigation practice, self-talk, humor, networking, help-seeking, writing, and listening.

When learners are first oriented to online learning, often much attention focuses on the technical issues which can be major barriers to learning in this environment (Mory, Gambill & Browning, 1998). Surprisingly, little attention is paid to critical psychological factors that can be equally important. Current views of learning and motivation suggest that one of these psychological factors is self-regulation of the learning process (Olgren, 1996; Zimmerman, 1986; 1990). Zimmerman (1986) describes self-regulated learners as those who are "metacognitively, motivationally and behaviorally active participants in their own learning processes." Metacognitively, they "plan, organize, self-instruct, self-monitor and self-evaluate at various stages of the learning process." Motivationally, these students believe themselves "competent, self-efficacious and autonomous." Behaviorally, they "reflect, structure and create environments that optimize learning." While there have been many studies of self-regulation in traditional K-12 learning environments (e.g. Zimmerman , 1990), there has been little exploration of this construct in the online learning environment in higher education. Furthermore, although there is a growing literature about various managerial, pedagogical and social strategies that instructors need to use in the online environment (Berge, 1996; Everett, 1998; McKenzie, Kirby, Newbill & Davidson, 1998; Mory, Gambill & Browning, 1999), there has been little discussion of how students can maximize the environment for learning.

The online environment can offer particular challenges to a learner (Eastmond, 1995; Hiltz,1994). In addition to technical access, problems most often mentioned in the literature are the absence of traditional communication cues, asynchronicity, multiple conversations happening at the same time, information overload, isolation of the learner, and a predominantly text-based environment. In a rare close-up study of a small group of learners in a computer conferencing environment, Eastmond (1995) found that although some learning strategies were suggested by their instructor, more "typically these students borrowed from their 'bag of learning tricks' the approaches, strategies, and tactics that had worked for them in other situations" (p. 124). Clearly, more study of how self-regulation works in an online environment might encourage online instructors to offer students more support for this critical factor in learning.

For the past three years we have been offering online courses in a masters program for practicing teachers at a large private midwestern university. The study reported here took place during the fall of 1999. It was designed to extend Eastmond's (1995) case studies of online learners by using Zimmerman's (1986; 1989; 1990; 1994) framework for self-regulation of learning to study a wider pool of students taking online courses. The study posed these questions: What is most challenging to students in the online learning environment? What specific strategies do students use to cope with these challenges? Primary data sources included: anonymously written surveys of 94 students who have successfully completed at least one of five online courses offered over a two year period and verbatim transcripts of face to face interviews with 14 of those students. Surveys and interview transcripts were read several times to identify challenges and strategies identified by these students. The strategies were then grouped under Zimmerman's categories for self-regulated learning (metacognitive, motivational, and behavioral).

Besides technical issues, the greatest challenges cited by these students in order of frequency were: time management, slow pace of discussions, isolation, work overload, and writing anxiety. Students identified metacognitive and motivational strategies similar to those discussed in literature on self-regulation (Zimmerman, 1986; 1990) but tailored for use in an online environment. They described strategies for goal-setting, pacing, planning, notetaking, summarizing, and self-monitoring that include anticipation of technical problems, server delays and the need to work both online and offline. The motivational strategies they described focused largely on beliefs about their technical competence. Many students acknowledged their initial anxiety about taking an online course but explained how early, even before the course officially began, they entered the course frequently to practice navigating and working in the new environment. Some developed special self-talk strategies to promote a positive mindset about learning online; others used humor both online as they interacted with other students and the instructor and offline as they worked on assignments. They also spoke of how they developed what they viewed as critical attitudes for online learning: patience, flexibility, and persistence.

Student discussion of behavioral strategies needed in the online learning environment focused primarily on social and communication strategies. The social strategies that students described included a variety of networking and help-seeking strategies that they used to reduce the isolation of online learning and access needed emotional and technical support early and often. Students reported networking with other students in the course, colleagues and friends. Frequent communication with the instructor and technical support people as well as consultation with printed and online "help" materials were also often mentioned. Some students also spoke of the need for specialized writing and "listening" strategies in the online environment. These included use of humor, graphics, informal speech, emoticons, and cut/paste methods to personalize communication in the online environment.

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Computers are Ready But How About Teachers: An Assessment of Turkish Basic Education Teachers' Inservice Training Needs

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Abstract

Recently, the Turkish government has started a new project for Basic Education Schools (partially financed by the World Bank) in order to take a major step for Turkey to leap to an information society. The purpose of this study is to investigate 592 basic education schools teachers' competency on computers and training needs. Analysis of data indicated that teachers do not feel competent on and ready for computer. Finally, this study offers recommendations for effective inservice training programs and technology integration strategies for the teachers.

Introduction:

Swiftly developing technology offers new opportunities for educational practice in schools. Increasing needs and expectations of the societies from information technology require according changes in the school curricula. Studies have shown that effectively used technology has the potential to improve the educational system (Jonassen & Reeves, 1996; Means, 1994). In recent years the agenda for educational development of many countries include the integration of computer technology into education (Plomp, Anderson & Kontogiannopoulou-Polydorides, 1996). Policy makers of those countries are forming decisions with respect to the introduction of computers in education to prepare children for a life in a technological society. But, for most of those countries the current situation of computer use in education can be considered as only a beginning stage of a process that could last many years (Plomp, Anderson & Kontogiannopoulou-Polydorides, 1996). For example, at USA, for years, schools have purchased large amounts of technology in hopes that students and teachers could use these tools for improving their teaching-learning process. Public schools are increasing access to these tools by putting more software and hardware in schools; connecting schools to Internet and providing cable and satellite capabilities (Zehr, 1997; Zehr, 1998). Despite this huge investment, few of the teachers actually use technology in their teaching (OTA, 1995). The main reason for the failure of integrating technology in USA educational system is defined as, although technology access has improved, teachers have been given little support in their efforts to use and integrate technology in their classrooms (OTA, 1995; Sheingold & Hadley, 1990).

The decisions of bringing computers to the schools deal with more than questioning what type of hardware and software should be used in schools. They also address curricular concerns such as technology's desired effects on education, needs for inservice training of teachers, and sometimes even the necessity of rearranging or adapting the physical facilities of the schools to accommodate computer use (Collins, 1990). Different visions about the place of information technology in education may lead to different emphases in policy goals and consequently, in actual policies.

IT Integration Efforts of Turkey:

Parallel to the international practices in reforming preservice teacher education for the new millennium, the Turkish Council of Higher Education has developed a new teacher training curricula for schools of education in 1998. According to the new curricula, a computer literacy course became a must course for all preservice teachers to fulfill the requirements for teaching credential. This new course is designed to improve and enhance teachers' IT skills.

In the same year, the Turkish government has started a new information technology project (partially financed by the World Bank) in order to take a major step for Turkey to leap to an information society. The main goals of the project are:

1. to bring the Internet connection and computers to the basic education schools,
2. to prepare the teachers about the use of technology, and
3. to start the integration of information technologies to the educational system.

In terms of its budget (1.1 billion USD) and its scope (15.000 basic education schools of Turkey) this is a very important and large-scale project for Turkey.

The success of such a project depends mostly on the teachers who will be the key people in enacting the curriculum. Teachers shape "the eventual success or lack of success of any computers-in-education initiative " (Collins 1996, pp.22; Yildirim & Kiraz 1999). Thus, type and quality of training teachers receive shapes the future of computers in education. In the related literature, effective IT training for teachers has the following features:

(a) educational technology training needs to be integrated into the entire teacher education program so that effective technology integration is modeled for pre-service teachers;
(b) the training should link technology with curriculum;
(c) the training should provide hands-on practice so that teachers become comfortable with them; and
(d) the training needs to be in-depth (Dell & Disdier, 1994).

Teachers are naturally involved in the educational use of computers and any educational innovation is filtered through them. Therefore, their decisions directly affect computer usage in schools. Teachers are the key players for a successful integration of computers to educational system (MacArthur and Malouf 1991; Yaghi 1996). As each teacher has her/his own way of using blackboard or any other tool in their teaching, how to use technology in education and how to integrate technology with education also changes from teacher to teacher. So, the success or failure of integrating technology in education depends largely on experience and attitudes of the teachers (Yildirim, 2000; Andris, 1995; Marcinkiewicz, 1993; Moursund, 1979; Stevens, 1980). Integrating technology in their educational system is very difficult task for the teachers, because not only they have to learn the new technologies but also, change the way they teach. Still helping teachers to learn technology may be the most important part of the technology integration reforms (OTA, 1995).

The Purpose of the Study

Unfortunately, not enough research on the factors that influencing the teachers use of technology in their teaching is done in Turkey. Being aware of teachers' problems and concerns for integrating technology to their teaching will help in the decision making towards a successful integration of technology into the curriculum and will guide the teacher preparation and in-service training programs for preparing the 21st century's teachers. With these issues in mind, the purpose of this study is to investigate basic education schools teachers' current attitudes towards computers in the school, their computer competency and training needs.

Research Questions:

For this study, we collected and examined relevant data to address the following issues:

1. What is the teachers' level of competency in using computers?
2. What are the teachers' inservice training needs?

Methods and Data Sources

Subjects:

A survey was distributed The study included 592 basic education school teachers in 7 provinces representing the 7 geographic regions of Turkey to determine their demographic information, level of computer use for instruction and administration, and their feelings toward computers in education.

Instruments:

Initial Survey:

The initial quantitative survey attempted to explore such issues as how teachers use computers for teaching and administration, what variables are correlated with computer use in the classroom, and whether a relationship exists between certain demographic information (age, gender, highest degree, and number of years teaching) and computer use.

Number of Computer Use:

Teachers were asked to report on the number of ways they use computers. Teachers were asked to rate their computer use in the following areas: preparing tests/handouts, homework assignments, administrative tasks, grading, testing and evaluation, demonstrations and simulations, drill and practice, and tutorials.

Computer Competency Scale:

A Computer Competency Scale (CCS) with nine categories of computer applications commonly used by teachers was developed. The CCS was found to be a reliable measure of competency (Cronbach $\alpha = 0.87$). Teachers were asked to rate their competency in the following areas: word processing such as Microsoft Word or Word Perfect, database management such as Access, spreadsheets such as Excel, presentation software such as PowerPoint, telecommunications (e-mail, CU-See Me), web browsing (Netscape, Explorer), education (discipline specific software), desktop publishing (PhotoShop), and Operating Systems (Windows). Competency in each area was rated from 0 (not familiar) to 3 (proficient).

Findings:

Descriptive Profile:

Data were collected from 592 (274 female, 318 male) basic education school teachers in 7 provinces of Turkey. The participants in this study were predominantly male (53,7%, n=318), and their age ranged from 22 (minimum) to 62 (maximum), and their year of teaching experienced varied from less than one year to 40 years. Their computer access is presented in Table 1.

	N	%
Home Computer		
Yes	99	16,7
No	492	83,1
Computer at Work		
Yes	164	27,7
No	420	70.9

Table 1. Teachers' access to computers at home and at work

Number and Type of Computer Use:

As Presented in Table 2, teachers used computers mostly for drill & practice applications and least for telecommunication tools in the classroom. When they are asked how they use computers out of the class, they ranked administrative and other instructional purposes as highest, and e-mail as lowest.

	N	Mean	SD
IN CLASS USAGE			
Highest (Drill Practice)	439	1,17	.51
Lowest (Telecommunications)	427	1,04	.22
OUT of CLASS USAGE			
Highest (Administrative)	434	1,30	.80
Lowest (E-mail)	427	1,08	.33

Table 2. Type of computer use

Computer Competency:

Teachers felt most competent on word processor and least competent on Internet applications as presented in Table 3.

Type of Application	N	Mean	SD
Word	555	1,90	1.02
Dbase	478	1,50	.88
Excel	449	1,62	.90
Internet	529	1,12	.48
Instructional Software	535	1,26	.65
Presentation Software	525	1,25	.63
Operating System	536	1,35	.71
Maintenance	532	1,16	.50

Table 3. Teachers' competency on computer applications

Previous Training:

When teachers were asked whether they received previous training on computers, 65,9% of them reported having previous training. (See Table 4).

Previous Training	N	%
No	181	32,1
Yes	350	65,9
Total	531	100,0

Table 4. Previous training

Discussion and Recommendations:

The purpose of this study was to investigate basic education schools teachers' computer competency and training needs. Data were collected from 592 basic education school teachers in 7 provinces of Turkey. Analysis of data indicated that teachers did not consider themselves as competent users of computers even though almost 66% of them had previous computer training and experience. Another important finding of this study is that teachers did not have adequate access to computers either at home or at schools. This finding explains the reason why teachers felt incompetent users even more than half of them had previous training. It should be noted that computers should be ready for teachers after they receive inservice training on using them. Otherwise, teacher would not be able apply and advance their computer skills that they acquired during the inservice training. Such a problem would also prevent teachers from moving one step further and integrating their IT skills into their teaching.

Basic education program (BEP), which the Ministry of National Education (MONE) of Turkey launched in 1998, aims to furnish all basic education schools at least with one computer lab. This effort, of course, will increase teachers' access to computers. However, integration of computers into curricula requires more than presence of one computer lab in each school site. Therefore, BEP should also provide new infrastructure and strategies for bringing computers into each class, school library, and teachers' launch. For example, the analysis of data revealed that teachers use computers mostly for administrative purposes. This finding clearly indicates that teachers do not consider computers as an inevitable part of their classroom or their teaching profession. Therefore, inservice training programs that the MONE will provide should not only put emphasis on computer skills but, most importantly, on technology integration skills as well.

Results also indicated that teachers are least competent on using the Internet. Beyond and doubts, this is a challenging problem for the BEP. It should be noticed that the Internet has not only changed the way people access information, but also reformed the way that people teach and learn. Therefore, the MONE should give the highest priority to Internet skills in their inservice training programs. Additionally, teachers should have access to Internet both at home and at schools. Considering the annual income level of teachers in Turkey (approximately 3,000 USD), teachers will not be able use or integrate their Internet skills in their profession unless the government provides them with free or low-coast Internet access.

Another important finding of this study indicated that teachers had different backgrounds (more 40 different majors) and subject matter expertise even all of them held a teaching certificate. This remains as a challenging problem for the MONE to provide appropriate training for all teachers due to their varying backgrounds.

Therefore, the MONE should inservice provide training that is designed for each teacher's current skills, needs, and background.

Finally, the MONE should realize that IT in education is more than buying computers. In order for this program to be successful, the ministry should provide effective inservice training and continues support for teachers that will suit their background and satisfy their needs in the class. Additionally, the ministry should prepare a technology plan that prescribes educational benefits of computers and a roadmap for teachers to bring these benefits in to their classroom. Otherwise, either the ministry or the teachers will realize the role of computers for providing better education for the children.

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